THE GEOGRAPHICAL JOURNAL

VOLUME LXXXVI

JULY TO DECEMBER

1935

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL

EDITED BY THE SECRETARY

THE ROYAL GEOGRAPHICAL SOCIETY

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The
GEOGRAPHICAL JOURNAL

Vol LXXXVI No 1 — R.G.S. — *July 1935*

PROGRESS OF GEOGRAPHY IN THE FIELD AND IN THE STUDY DURING THE REIGN OF HIS MAJESTY KING GEORGE THE FIFTH: *The Jubilee Address delivered at the Evening Meeting of 13 May 1935, by*

THE RIGHT HONOURABLE SIR HALFORD MACKINDER, P.C.

WE are met this evening to celebrate the Silver Jubilee of our Royal Patrons, Their Majesties the King and Queen. It is very right that in this Society we should wish to associate ourselves specially with the homage which at this time is being offered to them. During four reigns have we not enjoyed the leadership, in no merely perfunctory sense, of our sovereigns and princes? The Royal Geographical Society, it must not be forgotten, is not only one of a group of learned societies, but also a representative institution in the wider life of the nation. There is a simplicity of effort, a directness of achievement about the pioneers of geographical exploration which has raised the greatest of them to be world figures of the same heroic order, in the minds of plain men, as the great soldiers and sailors, great prophets, and great inventors. For more than a century it has been the privilege of our Society to speed our explorers forth, to welcome them home, and to reward them with honour, and in the performance of this function, the Royal countenance and co-operation have been of inestimable value, for they have raised our doings to a higher plane, so that our honours have been conferred on behalf of Country and Empire. Every year our Royal medals bear the stamp of the King's express approval. Moreover since the advance of geographical knowledge has been achieved by men of many races and accrues to the benefit of all mankind, they are awarded without regard to nationality. Nor have the occasions been rare when we have welcomed distinguished travellers, our own or foreign, with a Royal Prince in our Chair, and on one memorable date, our reigning Sovereign. The word "royal" in our title is no empty adjunct; it records that our kings and queens and princes have been co-workers with us, contributing that national endorsement and international comity which they alone can confer.

King George V is a sailor by profession and experience, who can appreciate with knowledge the oceanographical side of our researches. Since he left the

sea, on becoming heir to the throne, he and Queen Mary have travelled through all the Empire. Our Norman and Plantagenet kings were ever on the move, keeping Christmas perhaps at Winchester, and Easter say at Gloucester, and Whitsuntide at Westminster, and Michaelmas at Woodstock, so holding their people conscious of the unity of their England. It would almost appear that we are witnessing in our day a development under which our Royal Family is growing to be the imperial clan of our race, ever literally on the wing, as they perform their duty of focussing the loyalty of this unparalleled Empire. May it not be that posterity will look back on the unceasing labours of our King and his sons as to a routine so devotedly performed as to amount to genius? Will it not be said that in a time of hurricane rapidity of change they blazed a way out of the limitations which beset our ancient and insular constitution and adapted it to new world conditions? If so, you may be sure that posterity will remember that behind these dutiful men, playing her part with singular dignity and grace, was a wife and mother who is for us to-day our Queen Mary.

Ladies and Gentlemen, when the President did me the honour of asking me on this notable occasion to deliver this lecture, I naturally turned to the annual addresses in which the occupants of our Chair have rendered an account of their stewardship, and have referred to contemporary geographical events. Although we have throughout enjoyed the support of hereditary and constitutional monarchy, we must recognize that in our domestic history we have experienced some interesting vicissitudes. Last century did we not anticipate Mussolini and Hitler in our Murchison and Markham? Dictatorship can achieve great things, and as a Society we owe very much to our Dictators of the past. But it must be confessed that that form of executive has for a frequent incident that it leaves an aftermath of some difficulty and anxiety when the time comes for the conduct of affairs to return to normality. In the reign of King Edward we added to our written Charter a custom that our Presidents should henceforth hold office for three years only. As I turned over the pages of the last twenty-five addresses it became evident that to recount our annals year by year would quickly pall, but that on the other hand, the names of our triennial presidents could aptly stand for my chapter headings. The men whom we have chosen for our Chair have had strong personalities, and in three years have had the scope to make their influence felt. Moreover as it happens their successive rules have remarkably coincided with some of the floods and ebbs of world affairs.

There have been nine presidents in the quarter-century: it would be *lèse majesté* if I were to include you, Sir, the tenth in my list! The first, who was already in office when King George ascended his throne, bore, and I am happy to say still lives to enjoy, the great name of Darwin. It is an interesting coincidence that our Charter of Incorporation dates from 1859, the year in which Charles Darwin published the 'Origin of Species.' No fewer than five of the outstanding exponents of the evolutionary theory in the nineteenth century served their apprenticeship in geographical exploration: Charles Darwin himself, Joseph Dalton Hooker, Thomas Huxley, Alfred Wallace, and Henry Walter Bates. The geographical distribution of animals was one of the principal foundations of the Darwinian theory. Under the aegis of such a name and with such appropriate early associations, our ex-president, Major

Leonard Darwin, brought to us the mind and manners of a natural diplomat, and diplomacy in our President, and its frequent concomitant, administrative deftness, were our need at that moment. History of course never repeats itself completely, and I hope you will understand that I do not wish to press the analogy too far, when I compare our Darwin and his successor, Curzon, to Henry VII and Henry VIII. Henry VII had for his task to allay the disquiet in the land after the Wars of the Roses; on his work was built the spectacular success of the Tudor dynasty. We, too, had our Wars of the Roses. Far be it from me to decide as to the whiteness and redness of Markham and Freshfield, nor am I going to judge as between Markham and the Government of this land, but certain it is that partly as the aftermath of costly polar adventure, and partly as a consequence of the first battle for the admission of women to our fellowship, there were some feuds within, and there was some distrust without, of all of which you will find a lucid but discreet account in the able and amusing history of the Society from the pen of our friend, Dr. Mill. The times required just those qualities which a man of Darwin's prestige and character could contribute, and it was thus to a loyal and peaceful kingdom that Lord Curzon, ex-Viceroy, succeeded. In him we had our second Tudor, for did not Henry VIII build the first ships of the Royal Navy and so put England in the centre of the map for four centuries? And did not Curzon buy this house and freehold, and so secure a place in the sun for this Society in the spacious and dangerous time upon which we have entered? Nor was the work done with a niggardly hand, a vacant site was included as an endowment out of which as a nucleus this, his fine hall, has been posthumously built.

The presidencies of Darwin and Curzon will always be memorable, for it was in their time that both the North and the South Poles were reached. The men who stood first on those barren but glorious spots were the American Peary and the Norwegian Amundsen. None the less the epic stories associated with the names of Franklin and Scott will ever mark the lead of the men of our nation in the long and arduous campaigns of approach.

The half-dozen years before the Great War may perhaps be regarded as the divide between the dominance of the old and the oncoming in strength of the new kinds of geographical activity. The scope for pioneering was being rapidly narrowed. In his farewell address in June, 1914, Lord Curzon recorded that the problem of the Brahmaputra had in all essential features been solved. Of the major blanks on the map of the world outside the Polar caps there remained only Arabia. On the other hand Lord Curzon claimed that in his triennium thirty-six subjects of scientific geography had been discussed at meetings of the Society. Such names as those of Aurel Stein, the archaeological explorer of Turkistan, and W. M. Davis, the American geomorphologist, now mingle in our presidential surveys with those of Scott, Shackleton, and Mawson in the Antarctic; and Sven Hedin, the Swedish traveller across Asia.

The third and fourth of our Georgian Presidents were Freshfield and Holdich. They were the war Presidents and pathos attaches to both of them. Freshfield came to the chair after fifty years given to geography and to this Society. The opportunity of some crowning effort for the more effective pursuit of geography in our Universities now lay at last before him; within

six weeks the Great War had begun and all such ambition had to be laid aside. Holdich, too, with probably more experience than any of his contemporaries in fixing political boundaries, yearned for his chance when it came to the remaking of the map of Europe; the infirmities of age overtook him and he had to retire before the close of his term. Housed in its spacious new quarters the Society was all this while rendering a war service of quiet but high distinction. The notable journalist Keltie, who spread our influence far and wide, had resigned, and was significantly succeeded as our Secretary by the scientist Hinks from the staff of the young Cambridge School of Geography. Under his energetic administration maps were prepared for the incipient Air Force, and for the General Staff of the Army. The most remarkable of these works was the compilation of over one hundred sheets of a map of Europe and the Near East on a scale of one to a million. Some of these sheets were the documents on which were recorded the new frontiers enacted by the Treaties of Peace.

The fifth and sixth on our presidential roll were Younghusband and Ronaldshay. In the paucity of deeds to chronicle, they turned to contemplation, induced thereto no doubt by their experience of Indian mysticism. With charm of literary power they both gave us some noteworthy thoughts, Younghusband especially dilating on the aesthetic factor in any complete view of geography. Thus they led us, not without incidental gain, through the post-war depression. Out of that deep valley there emerged as it were by reaction that most idealistic of all our enterprises, the siege of Mount Everest. After a preliminary journey of reconnoitre, four successive expeditions have assaulted the summit of the world, but still the demons of frost, and wind, and sheer rarity of air hold the last citadel. The exploits on Mount Everest are typical of the new style of exploration: an easy approach to a relatively small field of work, complete technical preparation, a bold and sporting effort by young men, and results at once scientific and aesthetic.

Hogarth, our seventh president, worked a surprise. He had been one—indeed the leader—of a group of wandering and delving scholars—you knew them, Mr. President, better than any of us—who contributed their intimate knowledge of the Near East to the service of their country at war. Elected afterwards to our chair, Hogarth proved himself the accomplished scholar who is also the man of affairs, a type perhaps more common among statesmen than professors. In the short time before his death while still in office, Hogarth reorganized our house and staff, for geography was now recovering from the post-war lassitude.

It was about this time that the great desert of Arabia was at last crossed, and crossed again by Bertram Thomas and Philby. The literature which embodies the story of travel in the deserts and oases of the Near East is perhaps the richest and most poetic in all the history of exploration. Is it not indeed remarkable that the great waste which thirty and more centuries ago compelled Abraham and Moses and the Queen of Sheba to skirt round its limits should have been the last ice-free area on the globe to pass from rumour to the definitely known?

After Hogarth followed Close and Goodenough. In their so recent and happy tenure of office a geographical congress in London and Cambridge,

and our own centennial festival, brought back, in some degree at any rate, that international comity so essential in a field of study which needs, more and more every day, to have the whole surface of the globe under simultaneous observation. A keynote of these latter times has been the vigour and promise of the exploring clubs and groups of young educated men who have gathered themselves together in the Universities and elsewhere. To their credit we may set much of the recent advance of our knowledge of the North Polar region, shedding a passing tear I hope in memory of that born leader of adventuring youth, Gino Watkins. There are hundreds, perhaps thousands, of localities awaiting such intensive study as can be given by such parties. Meantime the disciplined advance of Government surveys goes gradually, if unequally, forward, enveloping the lands of the world with a network of triangulation. New methods of sounding are rendering practicable a similar work of survey, hardly yet begun, on the three times vaster bed of the ocean. Gravity surveys, amphibious in their scope, are beginning to impose a pattern of forces upon the map depicting forms, and the new accessibility of all the surface of the globe gives promise of such simultaneous and spherically complete data as will enable us to judge of the ever shifting balance of currents in the fluid atmosphere and hydrosphere. Subject to the play of forces from without and from within the globe, we should then be able to forecast the kaleidoscopic changes of seasonal pattern on the world's surface, upon which in turn depend the local yielding of the crops and the relative economic fates of the nations. At long last, and the sum of the required data is colossal, we shall transform the map of the world from a static to a dynamic pattern, in which the various categories of cause will be welded into a synthesis of effects, regional and global. But though vast the task need not daunt us, for three capital inventions, the internal combustion engine, wireless telegraphy, and photography, brought a long way towards perfection in the King's reign, have now multiplied our means of communication. The change in the power of geographical investigation which has come about in this quarter-century is indeed one of revolution, rather than of mere progress.

Ladies and gentlemen, I make no apology for venturing beyond my allotted span of twenty-five years. The shadows cast before us by threatened events are among the major causes of the present troubles of mankind. There is not much use in a survey of the past unless it leads us to a fresh insight into the present and a new vision of the future. Is not the crisis of to-day, which penetrates into every human activity and almost every larger thought, essentially geographical in its origin? Mankind has suddenly become world-conscious and has taken fright. The nations have run to their homes and are barricading their doors. They have realized that henceforth they must live in a closed system in which they can do nothing of which the repercussion does not come back upon them from the very antipodes. In an age that may become cruel, because imprisoned, their first impulse has been to make sure of their castles of refuge.

What is the meaning of this astounding Jubilee, this paean of loyalty around our ancient throne? Is it not that our people with a mass gesture—and millions cannot speak otherwise than by gesture—have seized an opportunity intuitively, doing more than they know, not merely to pay deserved homage to

their race-leader, but treating him as their type man, to say to themselves and to shout to the World: Courage.

You may tell me that all men have long known the world to be round, and that the Greek philosophers knew it more than two thousand years ago. True, but that was an academic dream. It was not till Magellan showed the way round that mankind at large woke to the actuality. Shakespeare made Puck put a girdle round the earth in forty minutes; that was a poet's embroidery on Magellan's achievement. But when discovery attains to the very poles, and you fly to Australia in fewer days than it took weeks, and you speak to New Zealand with the speed of light, mankind awakes with a shock to reality. What was a statement of the text-books has become a business fact.

You may tell me, and some of your recent predecessors, Mr. President, have emphasized the statement, that the discovery of the world is not yet nearly complete. Quite true: I have been told that in the Himalayas alone there are eleven hundred peaks over 20,000 feet waiting to be climbed. For many a long day there will be scope for bold deeds in the field, and patient toil in the study. But we have taken the measure of our problems. We know that we can if we will. The steel frame of our building is complete; we have now only to hang up the walls upon it. The effect of the shadow which will be cast on ancient lights is already obvious.

Until within the last very few years scientific men in their laboratories and explorers in the wilds went whistling lightheartedly to their labours, confident that their harvest must add to the welfare of humanity. It was General Smuts who, in his presidential address to the British Association in 1931, first sounded a note which brought to the surface an anxiety that was beginning to trouble the inner serenity of science. "One of the greatest tasks before the human race," I quote from Smuts, "will be to link up science with ethical values. A serious lag has already developed between our rapid scientific advance and out stationary ethical development, a lag which has already found expression in the greatest tragedy of history. Science must itself help to close the dangerous gap." In 1932 Sir Alfred Ewing from the same presidential chair echoed the same sentiment: "We are acutely aware that the engineer's gifts have been and may be grievously abused; man was ethically unprepared for so great a bounty." In 1933 Sir Gowland Hopkins, the President of the Royal Society, commented on these utterances as follows: "Of science itself it is, of course, no indictment that the command of nature has been put into man's hands before he knows how to command himself." That is, of course, true of science in the abstract. But when Smuts used the word, was he not uttering a challenge to Science in the sense of the world of scientific men? Is there nothing that the masters of research can do to steady the mind of the world which has been so profoundly disturbed by their explosive discoveries? Is there nothing incumbent on us here in this Society who have trained the explorers, sent them forth, and recorded their results?

You will observe that I have ventured to break the question into two: what can science do to help and what geography? To-day we are still on the high tide of the Jubilee; our people have seen a vision, have had a glimpse of heaven, have strengthened their will to salvation. But emotion alone is not enough. There must be appropriate mental equipment. Permanently working

forces will soon resume their pressure. Is there any steady current which we geographers can help to set flowing that may tend to bring science into closer relation with the values of life?

Science is dominated by the idea of research, and naturally so, for the results of science when applied to industry are giving man an almost miraculous control over nature. But research compels specialization, and specialization as a consequence pervades the teaching of science. This is inevitable where the training of researchers and of the technicians who apply the results of research is in question. But what of the training of that great majority who will not be engaged in research but must give themselves just to living? In these days they too must know something of science, but as part of their equipment for the business of life in the big world, not in the laboratory. The laboratory is specialized, but the world is not. There is of course the division of labour, but the proportion of specialization involved is very different from the isolation and abstraction of thought in the research laboratory. No doubt the researcher is ever on the alert for suggestions from outside, but with the idea of applying them to his special purpose.

It is all a question of which way the eyes of the teacher should be turned, to the increasing of knowledge or to the training of human beings. To the researcher science is an end in itself, but to the teacher it is a means to an end. The teacher can and should think of the bearing of science on the art of living; in other words, should think of its relation to moral and aesthetic values. To the researcher, as such, that is an irrelevant consideration, perhaps even an impediment.

The whole organization and outlook of the scientific world is to-day turned in the first place towards Research and to the applications of its results, and only in the second place to the education of the people as men and women and as citizens. Is not the geographer a natural teacher of science to the unspecialized citizen? As a matter of history, is not the parentage of all the specialist sciences to be found in Medicine and Geography? From these two the sowers went forth to sow: what more natural than that the harvests should be gathered in? In passing let us note that in Ethics and Politics the Greeks made a distinction in the realm of values which is parallel to the distinction between the mother sciences of Medicine and Geography.

The bridge character of geography, linking physical science to the study of humanity, so far from being the source of confusion that it appears to the scientist mentality, is the very means, is it not, of effecting what we are in search of, the closer approximation of science to human values? Indeed is not the still prevalent scientific suspicion and depreciation of geography indicative of limitation of outlook? I am going to suggest for your consideration that much, very much depends at this juncture on our view here of what should be the scope and methods of modern geographical study.

Consider for a moment the classical education which did, and in our older Universities still to some extent does, associate the study of facts and of values in a remarkable degree. Words and forms of speech are facts; when written down they become things; but the scholarship which studies them is always very near to the values of literature. At Oxford the Honour School of Humane Letters, esteemed the highest of the degree examinations, is not a test of

specialist attainments, for it demands a knowledge of scholarship, and history, and philosophy. Significantly it has produced eminent and cultivated citizens: Ministers of State, Bishops, Judges, Ambassadors, Civil Servants, Headmasters, and only a minority of scholarly specialists.

Consider now the nature of geographical as compared with scientific research. The physicist or chemist has before him myriads of repetitions of the same phenomena. He abstracts irrelevant aspects and isolates the relevant, and infers a law, such that he can foretell and in suitable cases produce with certainty given results from given causes. But the geographer seeks to decipher the pattern of a unique phenomenon, the surface of this globe. There can for him be no question of law in the physical sense, since there is no repetition of the pattern. Geography no more repeats itself than does History, and though there may be similarities of distribution on the earth's surface, they can but give ground for statistical generalizations, with probabilities, not certainties, for their effect. On the other hand Pattern is complex in the sense that causes of different orders are working together to produce interconnected results. The object of the geographer is to understand the concrete complexity, not to abstract and reduce to simplicity. Both geographer and scientist proceed no doubt by analysis with a view to subsequent synthesis, but the synthesis of the strict scientist is of like with like, whereas that of the geographer is of unlikes.

If this contrast of law and pattern holds good, the need of a separation between physical and human geography vanishes. The capricious action of the living Will may be irreducible to law, but it is certainly one of the causes of pattern. For his purpose the geographer lays all the sciences and humanities under contribution, and incidentally may have to teach both some science and some history. In my view it would be well if of set purpose he undertook such teaching in the case of Science as is required by the young citizen in the secondary school. Then in the mind of the ordinary man you would not have pigeon-holed sciences but a coherent universe tallying with the concrete Universe around.

The habit of accreting new facts to an established mental system must be acquired early. The geographical mentality which stows away new data in their appropriate niches in the world pattern will never be caught from the scientific specialist. Nor can it be learned in the way of information. An informed judgment postulates that the information shall be at call when required. A choice of action is presented to our citizen, say in an election or in the course of his business; his little conscious self consults his vast subconscious personality, and as the white corpuscles of the blood rush to heal a wound, so all his pertinent information gathers to a point, and by the time that he has wisely slept on his problem, the facts and values have been balanced, and his mind is made up. In a rich but disorderly mind there would have been the same subconscious activity, but facts and values only superficially relevant would have come to the point and the judgment would be unsound. To be a governing influence the world pattern must have slowly imbued the whole subconscious mind.

Is not the imprinting of that pattern well worthy of a considerable part in our national scheme of education? Like the multiplication table the map of

the world is with us for life. Enriched by scientific and historical contributions that map becomes the mental image of a dynamic system. Moved by solar energy from without, the fluid circulations of air and water impinge on the solid forms that are raised and lowered as the result of radio-activity within. Vegetation and soil interact so that they constitute together a single living skin to the Earth, which is of the very stuff of geography, the most intimate meeting ground of all the co-operating influences. We and the rest of the animals are mere parasites on that skin, but since we can move and bite we shape it at our will. The Gadarene swine rushed down a steep place into the sea and their infectious panic, a mental phenomenon, presents to the geologist a bone bed. Thousands of fellahin dig the Suez Canal, at the command of a Khedive, inspired by the idea of a de Lesseps, and you have an artificial strait. But the action of man on his environment, and the reaction upon him of the environment as modified by him, does not end the gamut of the geographical scale. Man is a part of his own environment, as cheese-mites are a part of the cheese. Finally from Man's Earth we rise to one of the greatest mysteries presented by physics and astronomy, the fact that through aeons of time temperatures within the short range between the freezing and boiling of water, 100 degrees Centigrade, have apparently never been absent from this Earth's surface, so that life—dependent on liquid water—has apparently been continuous throughout; while all the time elsewhere in the Universe there reign temperatures down to near absolute zero and up into tens of thousands of degrees. All life on this planet is dependent on an age-long but extraordinarily delicate poise of conditions.

When such a mystically great and yet practically useful geographical harmony is available, why continue to fit pigeon-holes into the minds of our citizens because the specialists who extract our science from the ore have hitherto had a lien on its teaching? I submit that the functions of research and teaching should be considered as of equal importance, but that they are essentially different in outlook and therefore in mode of work. I have spoken of the education of our citizens of express purpose; the training of researchers and technicians is another matter.

What is the net outcome of the line of argument I have ventured to lay before you? What is its bearing on our policy as a Society? The task of the pioneers having been accomplished what scope have we still before us? It seems to me as great scope as ever, but partly changed in character.

Every principal department of study has its own technique and its own philosophy. In a general way the element of technique diminishes as the element of philosophy increases. Starting from these premises I see before us four main grades of work. There is first that of the surveyor and cartographer. Here technique, instrumental and mathematical, including geodesy, is at its most exacting pitch and such as to demand a specialist geographical profession.

Secondly, we have the complete study on the spot of limited areas by groups of specialists supplementing one another. Leaders of men are born, but subject to that fact, it is to be hoped that the geographer will be given such share of control as will permit of his exercising his function of correlating the inquiries of his colleagues. For this work the geographical technique of the trained amateur will probably suffice.

Thirdly, we come to the study of the geographical aspects of other subjects. Here it seems to me that the geographer must in general be auxiliary only. He brings to the inter-scientific frontier his maps, ready made, and his trained faculty of thinking visually, but the technique from across the border almost invariably dominates. Consider the case of geomorphology: you cannot there go far in field research without a complete geological technique. The cases of geophysics and zoogeography are parallel. But with the alien technique there almost inevitably enters also the alien philosophy; neither the geologist nor the historian easily accepts the regrouping of his facts in another setting. For these reasons I have spoken of geographical aspects of other subjects rather than of special aspects of geography.

That brings us to our fourth category, the study of geography, independent and complete. Here geography is mistress in her own house. With so much experience of surveying as will give him a sense of the resources and limitations of mapping, and such familiarity with maps as will insure his geographical habit of thought, and enough knowledge of the outlook and philosophies of the contributory sciences and humanities to enable him to discount their bias, the geographer is in a position to build upon the static map a dynamic mental image. Equip him with the appropriate literary power and you have the philosophical geographer. His function, be it remembered, is to integrate and not merely to accumulate knowledge. His aim is so to digest the results of specialized research that they become available as a contribution to the assessment of values. Only so, or in some such way, does it seem to me that science itself can be adapted to the bridging of the gap between science and values, which gap is admitted to be a danger to civilization by the great scientific and philosophical leaders whom I have cited earlier in this address. A comprehensive idealistic science is the natural and appropriate counterpoise for the materialism of the specialist sciences, which of late have become unduly influential because of their brilliant application to the arts both of peace and war.

It will be seen that, in my conception, the first and fourth of our categories give us the essence of geography;[1] the second and third, though by no means to be neglected, are only geographical by the way. The fourth in its present outlook and ambition is something new. In this Society we can if we will marry the geography of the Ordnance Surveyor to that of the Professor. The University schools of geography owe their origin to the policy of this Society, initiated fifty years ago by Douglas Freshfield. To-day they should be a source of strength to their parent.

Let us recognize that academic opinion, perhaps the major part of it, still undervalues the potentialities of geography, and that there is in consequence some discouragement among some of our Professors. The best type of student is often persuaded into other paths by the idea that geography is a soft option in the curriculum. The Professor of Geography is at times conscious that beneath the friendly comradeship of the Common Room there is a covert denial of his real equality of status. This would not so much matter did it

[1] The distinction and interdependence goes back nearly 2000 years, to the time when Ptolemy the cartographer and Strabo the philosopher founded the twin traditions of geography.

not affect the estimate of their own subject held by geographers. Too often do they not try to appease the critic by differentiating between Physical and Human Geography—to the extent that in some Universities their teaching is divided between two faculties, thus sacrificing to the specialists its highest virtue? Since success in research is to-day the chief criterion of academic distinction, and since purely geographical research is not, except in such a branch as geodesy, of a kind that, however excellent, normally wins entry to the Royal Society, there is the standing temptation for the Professor of Geography to pursue his investigations in some borderland.

Far be it from me to undervalue such useful and often very fruitful lines of research; where men have come to geography from earlier training in some other subject they offer a natural scope. And far indeed am I from underestimating the impulse to scientific devotion which possesses those who come within the aura of the Royal Society. The Fellowship of that Society is the noble compensation of those who submit for a great end to the self-denials of specialism. But geography must have leaders of a different kind of ambition if it is to carry science as a vital strand into the new humanism demanded by the conditions of our time.

Let us grant that, apart from certain aspects of its technique, geography is not a science in the sense that physics, chemistry, biology, and even geology are sciences. Nor is it one of the humanities, like history. It is something apart—a concrete philosophy, with both scientific and humanistic roots, though with its own technique both of research and expression.

We must look to our Professors to found a new and great tradition both of thought and teaching. We must attract to our cause and hold to our main theme men and women of sufficient ability and attainments for firm grasp, wide outlook, and scholarly power of expression in a difficult, not an easy, branch of study. They are not likely to win the current honours either of science or literature, for they belong wholeheartedly to neither faculty. If and when the right way can be found, I plead for some mark of distinction to denote excellence in their particular kind of work, a label which may acquire a currency value in the academic world. It is to our advantage that they should rise to positions of command in their colleges and Universities, and to that end should have prestige added to them where it is earned and deserved.

One point more. It may be urged that these ideas are a counsel of perfection and therefore impracticable; that their application would postulate a supply of sound philosophers which, at any rate in geography, is not available. To bend under such criticism would, to my mind, be to submit to a fatal pessimism. What was the problem from which we set forth? Was it not that a dangerous gap has developed between science and values? The task is to induce the current philosophy of values to take fully into account the recent results of scientific research. General Smuts asks that science shall itself help in this persuasive process. Can science as such help except by presenting its facts in a form which can be more easily assimilated by philosophy? Because of its twin physical and human aspects I can conceive of no discipline more fitted than geography to take science right up to the gates of philosophy. Like Napoleon's army, science must disperse for supply, but concentrate for action in the field of values. Concentration involves generalship. In philosophy the

leaders have always been few and their disciples have gathered round them in schools of thought. It is recognized that in solitude even the best philosopher may lose his balance of judgment. There is an essential interplay between the imaginative lead of the few and the critical reception by the many.

The present trouble with our University schools of geography is, as it seems to me, that there is no adequate common tradition binding them together in aim and outlook. If the efforts hitherto made by this Society to bring them together have not met with complete success, the reason may have been that the attempts were not quite whole-hearted and persistent, or more probably that the time was not yet ripe. Within a generally accepted philosophical scheme there would be both enough guidance and enough freedom for many to do good work who could not themselves handle the larger ideas with mastery. Let us not forget that there is a specialism proper to the strictest conception of synthetic geography. As European Society is divided horizontally into classes and vertically into nations, and as proverbially it takes all sorts to make a nation, so geography offers special aspects to be studied by hybrid technique, but also presents regions to be philosophically viewed in all their aspects interlocked.

It is pertinent to remember that outside the Professorial ranks, including within them some notable surveyors and cartographers, there is a body of four thousand school teachers of the subject, gathered in the Geographical Association, to whom a coherent, generally accepted, and understandable conception of geography would be of the greatest advantage for holding their own in the scholastic environment. But I do not contemplate that teachers for secondary schools, vitally important as they are in a democratic Society, should be the only output of the University teaching of geography. In its setting as a prime element in the new humanism, geography should be brought to bear on the training of those citizens who, outside the technical callings, have in the past found in the classical education a way to eminence in Church and State.

DISCUSSION

Before the lecture the PRESIDENT (Major-General Sir PERCY COX) said: It seemed to the Council that it would be fitting that at the Evening Meeting in the Jubilee period nearest to Jubilee Day we should try to have a lecture on some aspect of geography associated with His Majesty the King and his reign of the last twenty-five years. We have been fortunate enough to get Sir Halford Mackinder who, apart from being a Vice-President of our Society, has been a very distinguished geographer for practically half a century. He is busily occupied nowadays in other directions of imperial moment and has not much time for the exercise of his geographical bent, but he is a man of vast experience of the geographical world, and has kindly consented to address us to-night on the very appropriate theme of "The Progress of Geography, in the Field and in the Study, during the reign of H.M. King George V."

I ask Sir Halford Mackinder to deliver his lecture.

Sir Halford Mackinder then delivered the lecture printed above, and a discussion followed.

The PRESIDENT: Dr. Mill, you have been associated with the Society for so many years and we look to your long experience of the Society so much. Will you come up and pay tribute to this eloquent address.

Dr. H. R. MILL: Long as I have been associated with this Society I have been associated with Sir Halford Mackinder longer. Fifty years ago we were both looking out with trepidation on the quaking bog which was called geography and wondering how we could build roads across it. That was in the year when Keltie, who long afterwards became Secretary of this Society, produced his memorable Report on the Teaching of Geography in Europe. From that time onward Keltie, Chisholm, Mackinder and I were associated in trying to find some rational method of raising geography from the low esteem in which it was then held towards the higher reputation which it now enjoys.

Forty years ago Mackinder and I were mainly associated in controversy, sometimes acute but never acrimonious. Thirty years ago we were mainly associated in co-operation, under the auspices of this Society, in formulating methods of study and, in various University institutions, selecting teachers and suggesting plans for making geography respected in the Universities. But during the period of the King's reign our association has been, so far as I am concerned, one of ever-growing appreciation of Sir Halford Mackinder's remarkable genius in grasping the "scheme of things entire" and showing the wide aspects of geography as it permeates all human thought, raising geography from a science to a branch of philosophy and carrying it forward to enlighten the practical affairs of daily life. Thus the findings of geographical thought work into the mental equipment of the practical man and enhance everyday existence and enjoyment.

To be called upon at a moment's notice to speak after an address such as we have listened to is a severe trial, because so eloquent, so graceful, so tactful an account of the way in which the powerful influence of the King and of the Queen has been interwoven with the work of this Society during the last twenty-five years deserves a considered appreciation. We have heard how in this period the work of the Society has itself been interwoven with the work of the Universities, making geography something that is not only important for its utility but beautiful in its aspects towards the higher realms of thought.

I should like, if I were able, to dwell on the enormous influence which Sir Halford Mackinder has exercised on geography. He carried out the ambitious dreams of Mr. Freshfield in founding the Geographical School in Oxford; he started the University of Reading and placed it upon a geographical basis; he took up the School of Economics and turned it not only into a geographically minded institution but a breeding ground for schemes of geographical research and exposition, such as Dr. Dudley Stamp's extraordinarily successful land utilization survey. In all his work Mackinder generalized from the facts of geography regardless of minor details, which to many of us—to myself at least, I confess—have allowed the trees to obscure the outline of the wood. He has always been able to see a subject as a whole, and that wide comprehensive view has led him to make suggestions which have inspired specialist students. I remember how the late Professor Gregory expressed in this hall his admiration of the way in which Mackinder's speculations, or rather intuitions, were confirmed by his detailed study of the origin of the sea-lochs of Scotland.

It has often been my fate, ladies and gentlemen, in speaking after inspiring papers read to this Society, to use the word "very" so often that when I received a proof of my remarks I had to strike out the superlatives. A little story will make clear my attitude to-night.

Once when I was crossing the Bay of Biscay I sat next to the captain at dinner, and he said: "You know I had a Morse signal from a foreign ship coming in the opposite direction to say the weather was very bad, and do you know how the poor fool spelt 'very'? He spelt it v-e-r-r-y." Well, it came on to blow very

hard indeed, and next morning at a depleted breakfast table the captain said to me, in a way captains do sometimes, telling an old story over again: "You know last night I had a Morse message from a foreign ship; and do you know how that fool of a captain spelt the word 'very'? " I replied, "Yes, with two r's." "Ay," was the response, "he did that, and he ought to have spelt it with three."

I should like to express my appreciation of this v-e-r-r-y remarkable, this v-e-r-r-y eloquent, and this v-e-r-r-y inspiring address, and I trust that the editor will respect that application of the elements of education and stay the hand of the printer's proof reader.

The PRESIDENT: Dr. Vaughan Cornish, would you address us for a few minutes.

Dr. VAUGHAN CORNISH: We have heard this evening of the progress of geography in the study as well as in the field during the last five-and-twenty years. The progress in the study during this time is largely owing to the pioneer work done by Sir Halford Mackinder during the preceding twenty-five years. His faculty for analysis and his stimulating power of presentation fostered the development of what I venture to call comparative geography.

Until about forty years ago geographical science was the science of map-making, including of course those explorations which provided a new material for the purpose. These aspects are in no way out of date, but modern geography includes something more. Geography to-day differs from that of former times in that it has grown to be a comparative science. It may still be defined, as I like to define it, as the science of the map, but it is now a science with a dual aspect, namely, the making of the map and the comparison of maps.

The events of the Great War and of the consequent treaties have brought into prominence the importance of a comparative study of historical maps, particularly in relation to those debatable borderlands which are a perennial source of dispute on account of their situation in positions where overlapping of cultural influences from neighbouring capitals has produced a conflict of loyalties. It appears likely that the treaties affecting the bilingual borderlands of European nationalities will shortly come up for re-examination, and it is much to be hoped that the Government will call on our professors of geography as expert advisers and not, as at Versailles, rely almost wholly on the professors of history during the preliminary stage and merely call in the geographer as a surveyor for the demarcation of a frontier already determined in principle.

I devoted my time during the war and for some years afterwards to the study of questions of this kind and I have no hesitation in claiming that in the study of the debatable lands the geographer, who begins by a comprehensive examination of the physical environment and goes on, secondly, to the study of the historical geography of the region, can make a contribution to the material required by statesmen for treaty making and for treaty revision over and above that which may be provided by the learned historian.

The PRESIDENT: Sir Halford Mackinder, referring to past-Presidents, coupled Sir Charles Close and Admiral Sir William Goodenough as Nos. 8 and 9, and said in their time there had been a marked development of the activities of the young explorers, the young University undergraduates going on their vacation expeditions. I would like to ask Sir Charles Close and Sir William Goodenough to make a few observations prompted by their own reactions to the lecturer's remarks.

Sir CHARLES CLOSE: I think it is exceedingly kind of the President to ask a parasite living on the skin of an oblate spheroid to address you to-night. We have had a very eloquent speech from Sir Halford Mackinder. Geographers have their different points of view, and I find some points on which I differ

from Sir Halford. But that is not a bad thing. A study is not alive if everybody agrees about what its contents are. Personally I feel that we are on the eve of a real change in our method of dealing with geography. That change, according to Sir Halford, occurred thirty years ago. I think it is going to occur now. As President of the International Geographical Union I have had ample opportunity of studying the views of foreign geographers, and I am quite certain that there is a tendency nowadays towards giving up the idea that geography is simply the mapping of this world and the exploration of its surface. There is a strong tendency towards discussing the human side, and I am convinced that it is the human side of geography which is eventually going to count. In that respect I believe Sir Halford would agree with me.

The particular point on which he would probably disagree is this: there is a very well-known philosopher who said there was as much science in any subject as there was mathematics in it. That conveys a certain amount of truth. Any science which is valuable to humanity must be, to some extent at least, quantitative. You cannot have a purely qualitative science of any real value as a science. Now I do not see any reason why the study of human geography should not be to a large extent quantitative, and I am sure that is the tendency of the studies and addresses at recent International Geographical Congresses, as any one who goes to those Congresses will have noticed. But to say that is not to say that we give up the idea of geography being a common meeting ground. That is one of its great functions. It is a common meeting ground in which many of us who are interested in different earth-sciences can join and work. I feel sure that this Society fulfils one of its most useful tasks when it gathers together people of different views. The sort of viewpoint, for instance, which, may I say, our Secretary takes is not quite the same as the lecturer takes. And yet those with differing viewpoints are all glad to meet together and discuss geography: geography fills a gap which otherwise would cause a very great disadvantage to the great body of science. I am not afraid myself to call geography a science in that particular sense—a comprehensive science and a common meeting ground for all of us.

Admiral Sir WILLIAM GOODENOUGH: My predecessor, Sir Charles Close, has taught me one thing which I was very glad to hear. I have always thought that he hardly considered geography to be a science. Now I hear him, I am glad to say, converted.

One of the things on which we have progressed most—and we have progressed—is that the watertight, airtight, idea-tight, speech-tight almost, compartments from which we used to approach these subjects is now largely broken down. We do view the whole of the knowledge and the consideration of this great geoid as being one matter, particularly, perhaps, in what one may call biology in all its forms.

You spoke, Sir, of the reactions that young explorers going out had on one. I speak without preparation of any kind. I see them going out, a mixed party, geologists, biologists, all those who have different interests joining together on one common ground. The place to come and discuss that ground which they have covered is this hall and this Society, for it is here that they will get every encouragement.

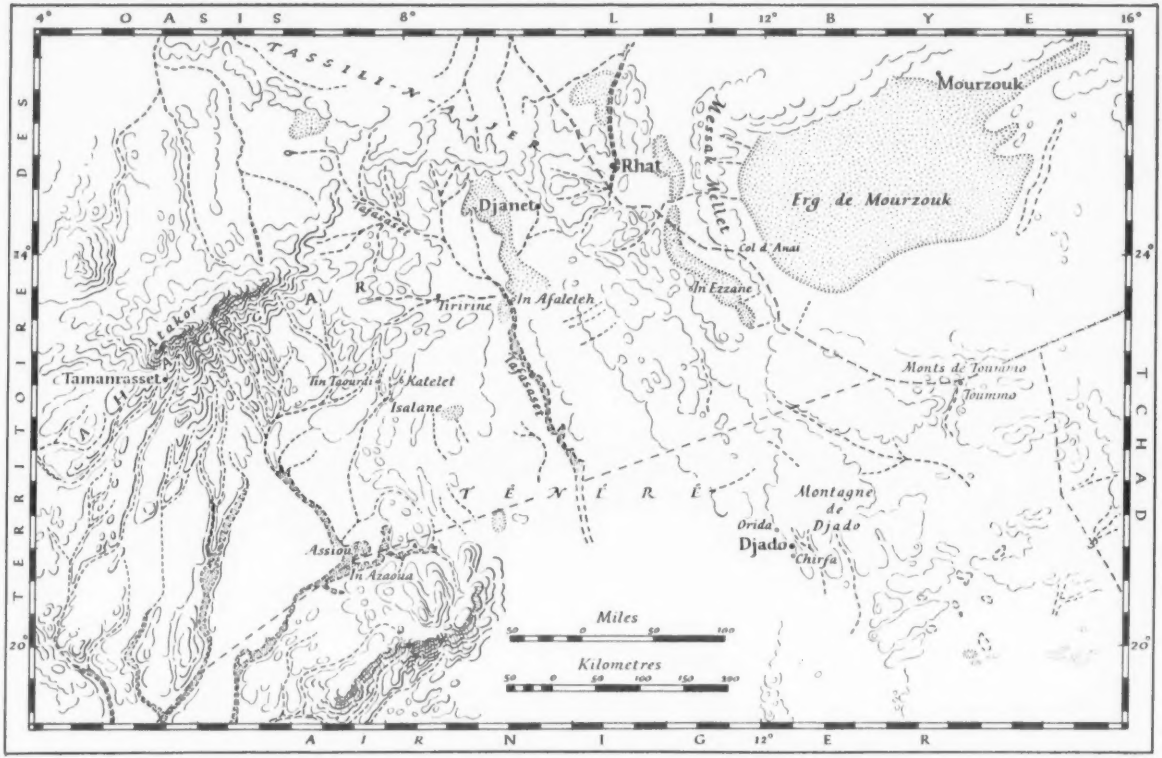
You have spoken of youth going forward. Never have we been in such an advantageous state in the way of young men coming forward to pursue the ideas which we encourage in this Society. I do not know whether some may remember a correspondence that went on after a certain headmaster made some rather foolish remarks with regard to the lack of initiative, the failure on the part of young men to do things. He was quite wrong. There was never a time when

youth, both young men and young women, were so ready to give up almost everything to prosecute their ideas, and they may be quite certain that here, as our lecturer has said, they will receive every encouragement.

I thank you, Sir, very much for giving me an opportunity to follow so distinguished a body of speakers.

The PRESIDENT: It remains for us to express our great gratitude and appreciation to the lecturer. I should like to say that Admiral Goodenough's remark as to these large expeditions of young University undergraduates exemplify the theory of the lecturer that now is the time in which we are separating our ideas and yet bringing them together for discussion here as geographers. I can tell you of an expedition shortly going to the North Polar regions, and one that was there a few years ago—eighteen young men, each of them with some different pursuit in which he was anxious to make progress, and all more or less amateurs with a good leader but all working together as a team and coming back here and giving their unified results. It was a very great and good example of the advantages of the view of geography which we take to-day.

As regards the Society, you may rest assured that we have done, and are trying to do, our best to enlarge our horizon and to encourage geography in all its aspects. We greatly thank Sir Halford Mackinder for what he has said to us to-night. He has given us a most eloquent and lucid survey of the geography of the past quarter of a century. I think you will agree with me that it has been a memorable lecture, and will go down in our annals as an outstanding one. I ask you to join me in thanking Sir Halford most warmly for his fine effort.



Les confins Touareg–Tebou: région traversée par l'auteur

Les confins Touareg–Tebou: région traversée par l'auteur

EXPLORATIONS SAHARIENNES: *A paper read at the Evening Meeting of the Society on 28 May 1934, by*

CONRAD KILIAN

DANS le Sahara ou Grand Désert, entre le pays des Touareg du Nord, au centre, et le pays des Tebous à l'Orient s'étendaient de vastes régions absolument inconnues; ce sont ces solitudes des confins Touareg-Tebou qui ont été l'objet de mes explorations.

Le pays targui, le Hoggar ou l'Ajjer, Tamanrasset ou Djanet, voilà mes bases de départ ou de retour; plusieurs fois j'en suis parti curieux avec passion au pas souple d'un mehari dispos, suivi de Touareg anxieux et chaque fois j'y suis revenu, satisfait, sur le même mehari, fourbu, ramenant tous mes amis, rassurés. Ces Touaregs vous les connaissez: les explorateurs britanniques ont été des premiers à les faire connaître; l'Hon. Francis Rodd a renouvellé récemment ici même avec éclat cette tradition et je ne m'attarde pas sur les "chevaliers au voile," leurs cours d'amour et leurs mehara blancs.

Je ne m'attarde pas davantage sur le Hoggar et ses montagnes volcaniques ou cristallines atteignant en leur pommeau l'Atakor 3000 m. d'altitude; étrangeté, magnificence quand, à la garde des hauts rocs sombres, tourmentés et prismés, la magie d'une récente pluie étend au flanc des monts un verdoyant manteau froissé de mauve, grasses crucifères, et que, dans le val profond, le printemps fait éclater de fleurs et de parfums suaves les bosquets de mymosées, de lauriers-roses, de myrtes. Ni sur les Tassilis de l'Ajjer, immenses plateaux gréseux aux vallées encaissées: en ces plateaux rocailleux et brulants, dans la grande entaille des monts, l'aiguade mire dans ses eaux immobiles, les piliers immenses, les arches fantastiques, les hautes murailles de ses bords vertigineux et quelques lauriers-roses aussi avec l'ombre et le silence; c'est encore, le trésor jalousement enserré, l'oasis ou Arrem, ses pèchers gracieux, et ses frais figuiers.

Je me suis d'abord attaqué au Ténéré du Tafasaset: c'est sur la carte une vaste tache blanche de 200,000 km. environ, entourée par l'Ahaggar, l'Ajjer, la Montagne de Djado, le Pays de Fachi et l'Aïr; les Touareg le disent absolument sans eau, sans bois, sans pâturages pour les chameaux, sans rien, bref la perfection des déserts, et ils le peuplent de génies malfaisants; ils ne le connaissent plus guère et redoutent de s'y aventurer; leurs parcours, leurs caravanes, leurs rezzous le contournent.

Je l'aborde pour commencer par le Hoggar et In Azaoua, un point d'eau situé entre le Hoggar et l'Aïr; d'In Azaoua je me lance à la boussole dans son côté occidental vers In Afaleleh autre point d'eau situé à plusieurs centaines de km. au N.E. entre l'Ahaggar el l'Ajjer. A In Afaleleh, mon but, le Tafasaset venant du N.W. se jette dans ce désert auquel il donne son nom; il en ressortirait justement à In Azaoua mon point de départ après avoir décrit dans son Ténéré une grande courbe vers l'Est et deviendrait ainsi tributaire du Niger; c'est ce que disent les Touaregs du Nord par tradition très ancienne.

Une après-midi d'avril nous partons donc à la boussole en direction d'In Afaleleh; nous sommes trois et cinq chameaux. Le matin nous coupons de

bonne heure les pistes qui vont vers l'Aïr; au sud, venant d'Assiou un ancien point d'eau important maintenant tari; sur ces pistes ont passé en 1850, coutournant le Ténéré, vos glorieux explorateurs Richardson, Overweg, et Barth.

Nous rencontrons ensuite étendus sur le sol des esclaves momifiés avec leurs fers aux pieds; l'un d'eux, spectacle touchant, est lié dans la mort à une esclave comme blottie près de lui. Quelle est la tragédie qui s'est passée là? La soif dans une tentative vers la liberté, semble-t-il. Les esclaves noirs du Soudan étaient autrefois la principale marchandise du commerce transsaharien et j'en contemple un instant les vestiges affreux.

Peu après nous passons en un endroit remarquable par la présence de deux beaux accacias et appellé Oua-n-Messak du nom d'un homme de Djanet qui y mourut; mon targui Mama me raconte l'incident: C'était le jour de la Sebiba, grande fête annuelle de Djanet, renommée dans tout le Sahara targui par ses danses énivrantes; Messak à cette pensée se met à danser, dans son ivresse il renverse son eau et meurt de soif. Ainsi tout au début de ma route par deux fois il m'est rappellé que la soif avec la mort plane sur ce pays.

Je lève et assure ma route, quand c'est possible, de hauteur en hauteur; sur chaque sommet je fais une station de planchette topographique avec, à l'alidade, visée sur le précèdent, en contrôle de mon orientation, et visée sur le suivant, que je choisis alors au voisinage de ma direction de route, le plus loin visible et du dessin le plus favorable à la précision de la visée ainsi qu'à l'établissement de ma station suivante au point éxact visé; la distance d'une station à l'autre est calculée à la durée de marche; quand l'état de ma monture le permet j'adopte pour distance la moyenne entre celle obtenue par sa durée de route au trot et celle obtenue par la durée de route des quatre autres chameaux au pas; en principe je fais des visées et des recoupements sur les pitons latéraux en vérification de mes distances, mais parfois seulement pour ne pas perdre de temps et quand les lointains s'y prêtent; la déclinaison a été calculée à In Azaoua au départ. Je note l'indication altimetrique d'un baromètre anéroïde à chacune de mes stations.

Les grès primaires avec intercalation d'argiles schisteuses sur lesquels nous faisons route depuis In Azaoua s'élèvent et finissent par quelque petits plateaux et pitons; des granits et schistes cristallins apparaissent par décapage des grès et constituent bientôt entièrement le pays devant nous. Je monte sur un de ces hauts îlots de grès, le dernier rencontré, pour une de ces stations de planchette par lesquelles j'assure et lève ma route; la vue porte très loin et je suis très surpris par l'aspect du pays à l'est et au sud-est. C'est une région rocheuse, accidentée et bombée avec quelques petits massifs montagneux; les queds y sont en réseau d'érosion finement gravé et j'ai l'impression d'un seuil crystallin liant l'Orient des montagnes du Hoggar à l'Orient de celles de l'Aïr, et pas assez fortement ensellé ou assez usé par l'érosion pour donner passage au grande oued Tafasaset. Désormais je me demanderai (plus que jamais) si le Tafasaset franchit bien ce seuil et s'il ne dessinerait pas plutôt son cours de l'autre côté, et de l'autre côté de l'Aïr vers Fachi et le Tchad; désormais je ferai mes observations altimetriques avec un particulier intérêt.

Nous coupons encore une piste avec une vingtaine de sentiers très profonds que les caravanes ont peu à peu enfoncés dans le sol. Cette piste n'est plus

frequentée, c'est une piste de jadis—on a beaucoup passé là autrefois indiscutablement. Il est curieux, cet abandon d'un grand chemin ancien. Déssèchement ? Insecurité ? Quelle fut la cause ?

Le pays est maintenant inconnu de mon targui; Mama est de plus en plus inquiet; bientôt il éclate de peur; il ne veut plus me suivre, la boussole il n'y croit pas, nous allons nous perdre et aussi peut-être surtout, il ne veut pas continuer dans ce pays diabolique des Kel Ténéré, Kel Ésouf et autres démons (djénouns) qui vont certainement nous ensorceler, et nous faire mourir par un de leurs tours habituels; la plupart de ceux qui se sont aventurés par là ne sont pas revenus dit-il, et l'aiguille enchantée ne nous préservera pas de ce sort funeste. Sa terreur est réelle; il n'est que temps, ajoute-t-il, de regagner les régions normales, et après avoir mis sa part d'eau sur son mehari il prétend partir vers le N.W. et nous laisser à notre mortelle folie.

Or Mama est seul de nous trois à connaître In Afaleleh le point d'arrivée, je ne peux me passer de lui; heureusement mon fidèle El Bachir, des Ansar d'Ouargla, a avant tout confiance en moi, et ainsi nous sommes deux carabines contre une; le rappel de sa parole donnée devant son Amenoukal, son roi, de me suivre ne détourne pas Mama de monter à méhari; nous armons nos carabines; s'il s'écarte nous abattrons sa bête; devant cette décision il s'arrête. Il est maté et désormais il nous suivra.

Les jours suivants je rencontre sur ma direction quelques monts espacés de 150 à 300 mètres d'élévation qui parsèment le pays sur notre direction et à notre droite; les oueds paraissent aller vers notre gauche, et il me semble ainsi cheminer sur le flanc occidental de ce large seuil de roche cristalline qui lierait morphologiquement l'Aïr au Hoggar et qui demeurerait assez saillant encore. Le 7ème jour apparait pour la première fois de la montagne à gauche, vers le N.W.; après avoir traversé une importante vallée coulant encore vers notre gauche, vers le S.W., nous cheminons désormais montagne à gauche, nous sommes maintenant sur le versant oriental du Hoggar. Après un petit erg, le 9ème jour, des grès horizontaux apparaissent par notre droite avec leurs plateaux et leurs garas et envahissent le pays devant nous.

Et maintenant c'est notre 10ème jour, il faut arriver au puits au plus vite, nous sommes au delà des limites de sécurité cameline à cette époque de l'année et sans pâturage vert; nous arrosons les narines de nos chameaux pour tromper leur soif ardente, et vers le soir je monte avec Mama sur une hauteur, j'espère qu'il appercevra et reconnaîtra la celèbre gara Tin Ba Kaza qui se trouve au sud d'In Afaleleh et nous courrons vers l'eau, de nuit, ainsi délivrés des nécessités visuelles et autres des opérations directrices par la planchette; il scrute longuement l'horizon devant nous; non, il ne reconnait pas.

Nous décidons alors, pour pouvoir marcher de nuit sans nous égarer, de gagner vers le N.W. une piste d'Isalane à In Afaleleh qui borde le Ténéré par l'Ouest et ne doit pas être très loin maintenant d'après mon relevé. Nous nous allégeons de tous les bagages qui ne sont pas strictement nécessaires à quelques jours de route—un des chameaux est terriblement atteint déjà: ses yeux sont tout petits par déshydratation dans le creux devenu ainsi trop grand de l'orbite, sa démarche est saccadée; je lui fais boire une grande cuvette d'eau.

Nous arrivons en effet dans le milieu de la nuit sur la piste esperée, heureusement distinguée, et nous la suivons désormais avec la vitesse maxima possible

—le mehari si mal en point nous retarde, nous l'abandonnons aussi. Et en avant—vite.

Le 12ème jour dans la matinée, voici au loin la dune qui couvre In Afaleleh; voici ses tamaris; joie immense; il est temps, nous n'avons plus que deux litres et les bêtes trébuchent souvent, toutes. Une coupe de sable blanc dans le sol noirâtre, stupeur et désespoir, le puits est plein de sable. Un bâton de tamaris fraichement coupé est planté dans ce sable, des caractères tifinars entaillent l'écorce, c'est un message. Nous le déchiffrons fièvreusement. Lors de mon départ de Tamanrasset j'ai envoyé des Touaregs pour vérifier l'état du puits et le curer si nécessaire—peut-être nous indiquent-ils une flaque d'eau subsistant dans un creux de rocher pas très loin, cela expliquerait qu'ils n'aient rien fait. Nous obtenons d'abord "au chef français, salut" ce sont bien eux, l'espoir emplit nos coeurs. Il est toujours très long de déchiffrer un message en tifinars, cela nous parait interminable—nous arrachons par brides "puits trop comblé pour tenter le mettre en état avec eau emportée, la soif presse, nous partons," et pour finir un souhait de bonne chance!

Mama est effondré: "*Rlass*, [c'est fini]" dit-il, "jamais nos chameaux ne pourront nous porter au puits le plus voisin, Tiririne, 80 km. et en admettant que nos mehara nous portent, deux litres à boire à nous trois, c'est insuffisant pour nous permettre de durer jusque là." Il me reproche la cuvette gaspillée pour la bête assoiffée que nous avons dû laisser en chemin, et va s'étendre silencieux sous un arbre, comme un condamné qui attend résigné son sort inévitable. Je laisse passer l'heure chaude de midi à l'ombre tamarine, la mort devant nos yeux.

Mais voilà la fraicheur, debout! luttons! Il faut tenter la vie. Je fais égorger une chamelle, la bête qui paraissait la moins assoiffée. Nous pendons sa poche stomacale à un arbre, la perçons avec un couteau très pointu en de nombreux points par dessous et la comprimons par le haut; un liquide scille à travers la parois et nous recueillons 9 litres environs d'une mixture épouvantable. Ce liquide bu tout de suite n'est certainement pas dangereux, mais il deviendra un violent poison, c'est de ce poison qui doit se développer rapidement avec la chaleur que sont morts, semble-t-il, plus que de soif, nombre de ceux qui ont utilisé ce moyen en semblable cas; nous faisons bouillir, filtrons à travers de la mousseline et obtenons 6 ou 7 litres d'une eau sans doute horrible au goût mais saine.

La fraicheur du soir ragaillardit nos bêtes et nous partons; nous n'avons plus que nos montures; pas et trot alterné toute la nuit; une fois nous nous arrêtons et faisons un peu de thé avec une partie de l'eau pure qui nous reste, buvons un long trait de l'infect breuvage et, par dessus, un verre de thé très fort et très sucré enlève le gout abject, soutient nos nerfs, et nous nourrit un peu—seule manière de boire désormais et de nous nourrir aussi, car nous ne mangeons plus pour ne pas nous assoiffer. Au lever du soleil nous avons fait plus de la moitié de la route.

Mais dès que le soleil parait, nos mehara retrouvent leur soif et ils avancent à peine. "*Rlass*", dit de nouveau Mama," ils ne nous porteront plus loin maintenant et ils crèveront avant le coucher du soleil; avec le peu d'eau que nous avons nous ne pouvons gagner Tiririne à pied, la moindre marche nécessite beaucoup de boisson, la mort revient nous assieger.

Dernier pâturage à l'Est de Tin Taourdi

Dernier témoin des grès des Tassilis sur les schistes cristallins d'Admer

Massif de grès entre In Ezzane et Toummo

Dent granitique près d'Efferi (Région de Djanet), modelé désertique et éolien

Miracle! occupés de ces sombres pensées nous appercevons soudain à quelques kilomètres, démasqués brusquement, de magnifiques gommiers qu'un repli de terrain nous cachait jusque là, de magnifique gommiers tout verdoyants. Nous sommes sauvés peut-être: nos chameaux seront à l'ombre ainsi tout le jour; le vert feuillage de l'acacia tortilis est désalterant, ils en mâcheront tout le jour aussi. Oh! Oui! Miracle.

Le soir nous pouvons repartir . . .

Mais il est sans doute écrit que je dois connaître toutes les angoisses, car vers le milieu de la nuit nous n'avons plus à boire du tout lorsque Mama s'arrête brusquement: c'est par ici, peut-être, l'eau, Tiririne, dit-il; mais il ne peut se reconnaître plus, et avec plus de certitude; sa mémoire est brouillée par la soif, il s'affole, et ce qui augmente son affolement sans doute c'est qu'il croit que les démons du Ténéré le poursuivent et se vengent. Serait-ce la mort tant contée par les arabes, à quelques centaines de mètres du puits sauveur?

Nous marchons pour en avoir une dans la direction suivie jusque là, cherchant à tout hazard des traces dans la nuit. Oh! joie ineffable, en voici, cette fois c'est vraiment le salut. Les puisards étaient à 500 mètres. Nous avons bu —nous avons fait boire nos braves montures lentement pour qu'elles n'en meurent pas, et toute la nuit d'heure en heure elles revenaient boire encore. . . . Nous sommes restés trois jours à dormir, anéantis par la détente de notre volonté, de nos nerfs qui avaient été trop exceptionnellement tendus . . . et par la fatigue.

Bientôt après c'était Djanet, l'oasis, le poste français, les amis, la joie.

La première exploration dans le Ténéré du Tafasaset, exploration à la boussole sur de grandes distances, est réalisée. Désormais aussi pour de pareilles ou analogues entreprises le précédent est créé, la peur superstitieuse dissipée, la confiance des indigènes dans la boussole acquise, la reconnaissance des possibilités camelines extrêmes faite, les méthodes de route sont expérimentées,—c'est presque la sécurité et la facilité—je devais en bénéficier comme d'autres.

Au printemps suivant, méharée vers Toummo. Cette fois, parti de Tamanrasset fin février j'ai gagné Tin Taourdi près de Katelet, de Tin Taourdi je me suis lancé, à la boussole de nouveau, vers Orida près de Djado écharpant le Ténéré du Tafasaset W.N.W.–E.S.E. et me surpassant en une traversée de plus de 500 km. première liaison directe Hoggar-Djado.

La route a été naturellement à la limite de la résistance—mais cette fois, malgré du désert plus absolu, moins angoissante que dans mon exploration première dans ce Ténéré. Sans doute vers la fin nous avons dû courrir aussi vers l'eau et avons eu la déception de n'en trouver plus qu'une quantité insignifiante, quelques litres à Errouy, point d'eau temporaire 60 km. N.E. d'Orida où nos chameaux, que nous avons laissés faire, nous ont menés à l'odorat de plus de 25 km.—mais nous avions vu la soif et la mort de moins près, nous arrivions avec toutes nos bêtes et tous nos bagages sauf quelques cartouches tirées pour nous alléger en fêtant l'Aid el Kebir; j'avais profité moi-même des précédents et des expériences de mes raids antérieurs et les choses avaient été mieux menées, notamment la technique cameline.

Vous devinez qu'il faut pour réussir des animaux spécialement choisis, entrainés et en forme, une manière de les mener et alimenter particulière, des soins exceptionnels; dans cette meharée cette technique cameline est particulièrement au point, mais je ne m'y attarde pas plus, c'est trop affaire de spécialiste. La stupeur des Kanori, ou Beraoua, à Orida fut des plus satisfaisantes, en apprenant que nous arrivions directement du Hoggar par la partie reputée rigoureusement impracticable, infranchissable, même par les farouches Tebous, ces gens qui passent pour les plus hardis au Tenéré.

Je dis maintenant adieu au théatre de mes premiers et plus rudes efforts, ce fameux Ténéré du Tafasaset. Il est absolue désolation, règne mineral pur, vastes étendues de grès et de plaines dures, ainsi que, mais moins centralement, de granits et roches cristallines. Je n'y ai pas découvert Djoua Tokalet, l'oasis perdue, mysterieuse, enchantée que les Touareg placent en son milieu, et n'ai pas eu d'indices materiels de sa réalité peut-être n'est-ce qu'histoire de chasseurs! J'ai observé toutes choses, j'ai fait des relevés, j'ai noté des côtes altimetriques. J'ai coupé dans ma dernière traversée au Km. 190 un grand Thalweg de côte 750 qui doit être le Tafasaset, et en liant toutes mes observations j'ai la quasi certitude qu'il ne va pas à In Azaoua et le Niger comme le disaient les Touaregs, mais vers le Tchad plutot, s'il ne meurt pas en se perdant dans les plaines situées à l'Est de l'Aïr. D'autres observations s'ajouteront aux miennes et les complèteront—et je prendrai soin qu'un raid Icerouane-Djado apporte des éléments de certitude sur le cours réel du Tafasaset. Le gros de l'exploration déblayé à chameau, l'automobile pourra intervenir ainsi que l'avion. Et j'ai innové une manière de vaincre le désert.

Et nous arrivons à Djado. Le Djébado, ensemble des oasis du très ancien royaume de Djado, peuplé de demi-frères des Tebous, des Kanori, a été visité pour la première fois par Beurnemann en 1862. Le Commandt. Gadel des troupes coloniales françaises y établit l'occupation militaire en 1906.

Je recrute, pour me rendre à Toummo, un guide Tebou, Ekadé des Teda Gouna—curieuse cérémonie: de son poignard de bras il coupe en deux une outre remplie de ces belles et delicieuses dattes du pays, me donne une moitié et prend l'autre. Il paraît que c'est la manière de serment, loyauté, et fidelité, des plus sacrée chez les hommes de sa race.

Par Chirfa, Belaga et Afounki, à travers la montagne de Djado, je gagne le Madama. Elles ne sont pas peureuses les femmes des gens de Djado, j'en ai rencontrées qui circulaient seules dans les montagnes une petite outre sur l'épaule. Dans les vallées des coloquintes étaient réunis en tas imposants, premier stade de la préparation d'une nourriture particulière au pays—les amandes des pépins de coloquintes, friandise qu'on ne prépare pas sans patience. Mais le temps ne compte pas pour ces peuplades.

Le Madama, ses plaines rouges, ses bosquets ravissants de mimosées (Acacia Seyal), ses nombreux points d'eau est pays des Tebous, des Teda-Gounas. Les Tebous ont chez les Touaregs, qui les appellent Ikareden, c.à d. les bandits, une reputation de trahison et de cruauté bien établie. Que ne raconte-t-on pas sur eux au Hoggar! Ils profiteraient de la nuit pour assommer l'étranger avec des sacs de sable, après l'avoir reçu en ami. Mais surtout, quand ils ont enlevé des femmes Touareg en razzia, en rentrant dans leurs campements, pour faire honneur à leurs épouses, ils les immoleraient

L'Oued Iskaouen dans les Tassilis de l'Ajjer

Les basaltes de Tin Edness (*Région de l'Amadror*)

Vue de la région du bas oued Tadent prise de l'extrémité orientale du Tassili du Hoggar

Lauriers-roses et faux gommiers dans l'Oued Issandilen

avec raffinement cruel: les vieilles par épuisement de leur sang, les pieds préalablement fendus profondément entre les doigts, en les faisant courir et bondir, attachées à la queue de leurs chameaux, dans la charge d'arrivée, les jeunes par brisure des reins en les montant à califourchon fixées à quatre pattes sur l'échine de leurs méhara, dans le galop d'arrivée aussi.

Il ne m'arrive cependant rien de fâcheux dans le Madama. Je bavarde beaucoup avec Ekadé et non sans apprendre une foule de choses sur ses frères, leurs usages, leurs traditions, et leur histoire. Comme chez les Touaregs du Nord, il y a chez les Tebous le souvenir d'une époque où le chameau était inconnu; il aurait été introduit par l'Ouadaï, je poursuis ma documentation sur cet age pré-camelin, garamantique—du nom d'une peuplade de l'antiquité les Garamantes qui habitait le Sahara dans ces temps anciens. N'est-il pas tout particulièrement favorable à ces entretiens ce Madama qui était, me dit Ekadé, un des pâturages à boeufs mémorables des ancêtres ?

Un orgueilleux plateau, quelques puisards creusés obliquement dans le roc en un ravin désolé, c'est Toummo. Nous ne nous attardons pas, l'absence complète de végetation, de pâturages, oblige à ne faire que passer dans ce val roccailleux et brûlant; en outre c'est un endroit très passager, nous risquons d'être surpris à tout instant. Nous restons une vingtaine d'heures pour nous abreuver par deux fois d'eau froide et délicieuse; entretemps chacun de gorger ses bêtes de dattes et de mil; la nuit, nous reposons la tête sur nos fusils.

Le Capitaine Duprez, commandant la Compagnie saharienne de l'Ajjer et le Lt. Fouquet du Service Géographique de l'Armée sont venus à Toummo l'année précèdente, en reconnaissance avec une section méhariste. Ils devaient aller ensuite sur In Ezzane.

Les Tebous ne se risquent pas de Toummo en direction d'Anaïoud' In Ezzane: la région passe parmi eux pour présenter de la montagne accidentée, avec des gorges infranchissables. Ekadé qui était aussi le guide du Capitaine Duprez, lui exposa non sans véhémence qu'il ne pouvait être question de se lancer avec tout ce monde et ses chameaux divers dans une pareille aventure. Duprez et Fouquet ont dû renoncer avec désespoir à leur projet et revenir au Madama. Mais ils ont voulu quand même lutter contre l'inconnu à l'ouest et quoique Ekadé n'ait que de vagues souvenirs très anciens d'un rezzou de ce côté auquel presque enfant il avait participé, ils ont voulu tenter quand même, puisqu'ils avaient seulement l'assurance qu'on pouvait passer. Ils ont frôlé le désastre complet!

Ekadé à un moment ne s'est plus souvenu, et ils étaient engagés trop avant pour battre en retraite; ils ont alors erré à la recherche de la gara de forme particulière du point d'eau d'In Ezzane; de nombreux chameaux étaient abandonnés, d'autres trainaient; la mort par la soif était au plus près, la souffrance de presque tous les hommes était déjà atroce quand, juste à temps, ils coupaient la piste d'In Ezzane à Djado qui leur était connue, les menait au salut et les délivraient de la tragédie; le combat contre l'inconnu avait été dur mais Duprez et Fouquet avaient triomphé de la trouée d'Achelouma ou Chelema, le chemin el Ouar des Touaregs, et ils avaient fait dangéreusement du beau travail d'exploration.

Il ne faut pas rester sur cet échec d'admirables amis. Je sors d'une rude bataille contre le Ténéré, mes chameaux sont à moitiés fourbus, mon matériel

scientifique hors d'usage, montre arrêtée avant Orida, planchette topographique inutilisable, appareil photographique désarmé de son magasin par rupture des vis fixant les glissières, baromètre éclaté sous un coup de cravache, nous mêmes vivons sur nos nerfs. Qu'importe? j'aurai raison de cette côte insolente. Nous descendons le val de Toummo, nous sortons ainsi de la haute barrière méridienne, les monts de Toummo, dans laquelle nous nous étions insinués; nous débouchons dans la plaine; nous mettons le cap sur In Ezzane. Ekadé nous dit adieu: "Oui je crois que tu dois marcher droit où tombe le soleil; ne t'inquiète derrière toi que pendant deux jours, dans la direction où tu vas, on ne suivra pas tes traces plus avant."

Nous marchons d'abord dans une plaine à petits reliefs horizontaux de grès récents que dominent quelques importants îlots tabulaires de grès anciens; l'écoulement en paraît vers le Madama. Nos provisions de dattes et de mil sont en grande partie consommées; nous emportons quatorze outres d'eau seulement; nous sommes donc cette fois peu chargés. Quelques touffes de crucifères inespérées, notre nouvelle direction de route, direction de retour vers le pays targui, très remarquée par eux, ces deux faits ont achevé de rendre nos méhara légers et pleins d'entrain. La proue de leur encolure d'un balancement cadencé attaque allégrement l'espace; l'étrave recourbée en rythme syncopé gaiement mord dans une invisible houle.

Vers le milieu du deuxième jour, par des ravins sinueux au travers d'escarpements peu considérables, nous accédons facilement et commençons de cheminer sur un vaste plateau ondulé de grès anciens horizontaux et noirâtres. Nous marchons jusqu'au coucher du soleil sans l'apparition d'aucune difficulté, mais dans une absence totale de végétation, et il faut ce soir-là encore nourrir les chameaux par nos propres moyens.

Le troisième jour, le matin de bonne heure, nous découvrons, avec un petit acacia et un peu d'herbe sur lesquels se précipitent avec joie nos montures, un oued peu encaissé, d'écoulement manifestement septentrional. Ce plateau sur lequel nous cheminons depuis hier joue donc un rôle considérable en Afrique: il porte en son faîte la ligne de partage des eaux entre le bassin de Madama et celui de l'Erg de Mourzouk, entre le Tchad et la Méditerranée. Nous franchissons le vallon sans effort et poursuivons notre route: oh! chance! il a plu et ce ne fut pas sans effet: l'acheb frais et tendre s'offre entre les dalles, nos méhara font un repas précieux pour l'avenir incertain. Soudain un oued encore coulant vers le nord, mais cette fois profondément encaissé. Il enserre à nos pieds, entre ses sévères et sombres murailles, le sourire enchanteur de ses grands acacias, de ses parterres fleuris, de son clair lit de graviers fins; ce sourire de la terre à nous seuls, donné dans le secret des solitudes, a un charme idéal.

Le ravin est infranchissable devant nous; nous allons vers l'amont le long de ses abîmes en quête d'un point favorable; le temps passe; les Tebou auraient-ils raison? Si l'obstacle se prolonge nous devrons renoncer à aller plus loin; heureusement voilà la fin, l'oued cesse d'être encaissé, nous le traversons facilement et reprenons notre direction primitive. Ce n'est pas sans une inquiétude plus vive que nous avançons désormais: quelques ravins de ce genre, par le temps qu'ils nous feraient perdre, ce serait la soif, la mort, le désastre. Le soir nous trouvons, il est vrai, un peu de pâturage, un duvet de

graminées qui verdoie sur une surface ensablée, mais par contre un nouveau sujet d'angoisse encore: de grandes barkanes isolées, un bras de dunes nous font craindre la rencontre d'un système de sables important; nous ne pourrions le surmonter sans beaucoup de temps et de fatigue; ce serait le désastre aussi.

Le quatrième et le cinquième jour nous continuons toujours de cheminer sur ce même tassili; il est devenu tout à fait monotone, et de vague en vague l'étendue rocheuse est pareille; nous ne trouvons rien pour la faim de nos bêtes, mais par bonheur il n'y a pas de nouveau ravin et pas de grand erg non plus. Et voilà que, au soir de ce cinquième jour, nos vues, jusque là limitées d'ondulation à ondulation, éclatent sur un horizon lointain, le sol manque devant nous, nous sommes au bord du plateau.

Nous cherchons, El Bachir et moi, dans l'immensité ainsi brusquement étalée sous nos yeux et nous reconnaissons tout au loin, dans l'or "où tombe le soleil," dans des sables qui poudroient, des silhouettes qui ne nous sont pas inconnues: ce sont des gara atteintes ou aperçues en un raid de préparation mené l'été précédent dans l'Orient d'In Ezzane, et nous sommes donc sur les escarpements continus et imposants que nous avons observés alors faisant suite au Messak Mellet à partir d'Anaï vers l'est. Cette côte, ce faîte sur lequel nous marchons depuis plus de trois jours sépare ici le bassin du Taïta de celui de l'Erg de Mourzouk, l'Ajjer du Fezzan, comme il sépare plus à l'est, ainsi que nous l'avons vu, le bassin du Madama de celui de l'Erg de Mourzouk, le pays des Tebou-Gouna du Fezzan.

Mais les chameaux ont faim et la soif ne va pas tarder; il faut gagner In Ezzane au plus vite maintenant; par une coulée de sable nous nous jetons dans les escarpements, la plaine, l'ombre, la nuit et nous laissons derrière nous, debout, en veille dans le ciel étoilé "des montagnes"—les montagnes que j'ai appelées les "Monts Doumergue"—ma dernière victoire sur le Grand Désert.

Je rentre ensuite à Djanet, mettre au net mes notes et mes relevés. Les officiers du Service Géographique de l'Armée, des Troupes Coloniales et des Compagnies Sahariennes continuent désormais l'oeuvre de connaissance géographique des confins Touareg-Tebou que j'ai menée jusqu'aux bornes du domaine de l'exploration française.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: As you know, Ladies and Gentlemen, the paper which is to be given us by Monsieur Conrad Kilian to-night on the subject of his "Explorations Sahariennes," is to be delivered in French.

I should tell you that Monsieur Kilian is by profession a geologist, but for a good many years past he has been figuring as a Saharan explorer of the most catholic type, interested not only in the geology of the great desert but in all scientific problems connected with it; a devoted student, in fact, of everything associated with the Sahara and its inhabitants. By 1922 he had already earned a high reputation as a daring and resourceful traveller, in connection with his exploration of the Hoggar Massifs, the geographical results of which were published in various scientific papers. In 1924 he brought out a volume on the subject entitled 'Au Hoggar,' a review of which appeared in the Society's *Journal* for 1926. The conclusions which he came to therein profoundly modified the

hitherto accepted views of the geology and geography of the Hoggar mountain range.

After spending most of his time in France during the following three years, M. Kilian started again on his travels and on this occasion he spent no less than three and a half years in the heart of the desert. During this period, though he did some more geological work in the Hoggar, his interest was mainly attracted to the little-known Tebou country east of the Hoggar and thence westwards and southwards towards the Italian Fezzan border. This tract is a very arid and broken one, containing a proportion of sand-dune country, but composed mainly of a plateau with massifs of great complexity and ruggedness. Monsieur Kilian's activities during these three and a half years resulted in the filling in of one of the largest blanks in the Saharan map—an area not less than 200,000 square kilometres in extent, lying between Hoggar and In Afaleleh in the west and flanking the Italian border of Fezzan to the north and east. It is this latter portion of his travels that he proposes to speak about to-night.

With these preliminary observations I will ask M. Kilian to begin his address.

M. Kilian then read the paper printed above, and a discussion followed.

The PRESIDENT: I will now call upon a member of our Council known to you all, Mr. Francis Rodd. Those who have read his very able book 'The People of the Veil,' in which he gives an account of his travels in the Sahara, will realize that he is the Fellow of our Society with the most intimate knowledge and experience of the Sahara to-day and best qualified to appraise the details of M. Kilian's achievement.

Hon. FRANCIS RODD: You have heard, I think, one of the most remarkable stories of desert travel and exploration that it has ever been my lot to hear, and you have seen one of the very few Europeans who have suffered the hardship of thirst to the point which M. Kilian suffered and have had the experience of drinking the watery contents of a camel's stomach and surviving. M. Kilian's two journeys are certainly the most important that have recently been made in the Central Sahara. He established, as the President indicated in introducing him, that the watershed between the Niger and Lake Chad lies many hundreds of miles farther east than had hitherto been suspected. The great valley which M. Kilian explored is an enormous watercourse that starts in Southern Algeria which hitherto had been thought to flow (or rather that its channel went) to join the Niger, a little down stream of Timbuktu. M. Kilian and his successors appear to have established beyond any reasonable doubt that the valley, instead of running down towards the Niger, turns eastwards or south-eastwards and either falls into the basin of Lake Chad or dies out in the desert between Aïr and Tibesti.

The second matter which M. Kilian established was the lie of the high plateau or crest of ground which connects the massif of Tibesti running, as you know from the French explorers we have heard here, up to over 10,000 feet, with the plateau of the Ahaggar and the Central Sahara. That crest, along which M. Kilian travelled and from which he saw an even higher range of mountains, remained up till then, and I think up to the present, unexplored and certainly unnamed. It is this crest of high ground along which the tropical vegetation of the Mediterranean, and certainly some of the fauna, reached the Mediterranean from Equatorial Africa. I think it is fair to say that those two pieces of geographical knowledge collected by M. Kilian on the two journeys of which you have heard to-night are probably among the most important which have been discovered in North Africa for some twenty years.

But M. Kilian's researches and learning in connection with things appertain-

ing to central North Africa are not limited to these discoveries. He spoke of the Garamantians and he has asked me to say how regretful he is that some of his slides which had further bearing on this subject had not arrived from Paris. He has established to my mind without any shadow of doubt that the stories of the Garamantians which have come down to us from classical authors and which up to thirty years ago had been regarded as legends without any foundation whatsoever are, in fact, true. The legends or the stories for which Herodotus earned an unenviable and entirely libellous reputation of being not the Father of History and Geography but the Father of Lies have, in fact, been more and more substantiated as exploration in North Africa has progressed. And M. Kilian's part in vindicating his reputation has been no small one. Among other things he brought back were some of the so-called "emeralds" which were the origin of many of the Garamantian trade routes. Those of you who want to extend your knowledge of this particular subject can go to Paris now and see in a Saharan Exhibition, for which M. Kilian is very largely responsible, not only the carved emeralds or, as he would say more accurately, the carved Amazonite which he brought back from the Azjer Tassili, but also pictures of the chariots of the Garamantians drawn by four horses with a driver depicted on rocks recently discovered and photographed by M. Gautier and M. Reygasse as lately as only three months ago.

In that exhibition, for which, as I say, M. Kilian is much responsible inasmuch as he was a prominent member of the Organizing Committee, this Society has exhibited a substantial collection of records of the early travels in North Africa which we in this country undertook. We have exhibited, many for the first time, records of Major Laing, Mr. Davidson, Mr. Richardson, Dr. Barth, on their travels in the Western and Central Sahara, and also of the early journeys of Captain Denham, Captain Lyon, and of Major Oudeney and Dr. Clapperton on the Trans-Saharan Route to Lake Chad. The arrangement of the records which the Society has sent over has been largely in the hands of M. Kilian, and I feel that for the lecture which he has given us and for the contribution which he has made to Saharan exploration we all, and the Society in particular, owe him a very deep debt of gratitude.

The PRESIDENT: Major Bagnold is with us to-night, I am glad to say. As you will remember, he has travelled extensively in the Libyan Desert and had not his military duties transported him to China would have read us a paper last session. In his absence it was read by his comrade Mr. W. B. K. Shaw. I will ask Major Bagnold to make such comment on M. Kilian's work as his great experience as a desert traveller may suggest.

Major R. A. BAGNOLD: M. Kilian's lecture and the pictures we have seen suggest by the contrasts and similarities they offer to the country I know farther east very many questions I should like to ask; but I am afraid there is no time.

My own experience of that part of the world has been in the Libyan Desert, and I admit it has been by motor car. I am sure you will agree after hearing M. Kilian's lecture, and particularly after seeing the slides, that there is a charm about camel travel with which the motor car cannot compete. One travels too fast by car really to see and appreciate the details. But whether one goes by camel or by car I think one of the chief attractions of travelling in an uninhabited country about which few or no native reports are available is the feeling at the back of one's mind that one might come across anything just over the next hill or the next horizon. These countries can only be explored a little at a time, in a narrow strip along a traveller's actual route, but things of interest always do turn up—sometimes, as we have heard to-night, many and most important things.

The PRESIDENT: It remains for me now to convey our hearty thanks to M. Kilian for a very interesting and important paper. I am sure you will have been no less moved than I was by his wonderfully vivid account of his experiences during those twelve never-to-be-forgotten days which so nearly ended in a great tragedy. I am sure too that you will have sympathized with him in having had, on such a critical occasion, the company of such a confirmed pessimist as his guide, Mama. It is hard to imagine being placed in more trying circumstances and it was undoubtedly only M. Kilian's courage and determination which saved the party.

It is extraordinarily interesting to me to realize—a fact with which I ought perhaps to be familiar—that the camel which one has been inclined to associate with desert life from time immemorial is a comparatively recent arrival in the Sahara; also to see from the rock-carvings that the lecturer put on the screen that oxen throve in the country not so very long ago; showing that the region must have been subject to very rapid and comparatively recent desiccation. Numberless interesting problems like these are suggested by M. Kilian's lecture, but there is no time to discuss them here even if one had the technical knowledge to do so.

I ask you to allow me to thank M. Kilian most cordially for coming over here to lecture to us, and to congratulate him on his very important achievements in the Sahara.

RENNELL'S COMMENTS UPON THE JOURNEYS OF PARK AND LAING TO THE NIGER

THE HON. FRANCIS RENNELL RODD

IN 1798 W. Bulmer & Co. of London printed for the African Association an abstract of Mungo Park's 'Account of his Travels and Discoveries, abridged from his own minutes by Bryan Edwards,' and in the same volume "Geographical Illustrations of Mr. Park's journey, and of North Africa at large," by Major Rennell, who also compiled the three maps which are bound up in the volume. Rennell's study and two maps were republished in Park's book which appeared in 1799.

Major Rennell comments at great length on Mungo Park's first journey from which he had returned to England at the end of 1797. The copy of the proceedings of the African Association in the writer's possession was Rennell's own and contains numerous textual alterations and comments. Rennell's additions to the map which he prepared to illustrate Mungo Park's first journey consist of a number of places on or near the Niger at Bamako, with their reported latitudes and some notes on the supposed course and source of the Upper Niger according to information collected by Major Laing. Rennell notes that Park's position for Sankari at the source of the Joliba or Niger differs by 220 miles from Laing's Sangara, doubtless intended to be the same place. Below Silla, the farthest point downstream reached by Park on his first expedition, Rennell notes in ink on the map referred to, a "River of Laing from the N.W. thro' Nasina (or Masina)—and Qu : of Gov. Barnes from Betoo." This river is sketched in as joining the Niger at Jenné and

coming from the Great Desert (shown on the map) to the north-west where Rennell notes "Perhaps the Betoo of Gov^r. Barnes (1764)." The River of Jenné, which as a matter of fact is not the Niger, joins the Niger at Mopti. How this river of Governor Barnes and Laing from the north-west is to be identified is not clear.

Rennell's notes and his emendations on his own map of Park's travels were made from Major Laing's book, 'Travels . . . in Western Africa,' which was published by John Murray in 1825. On February 5 of that year the author set out for Timbuctoo *via* Tripoli, where he married Consul Warrington's daughter Emma on July 14 and left on July 16 for his memorable crossing of the Sahara from which he did not return. He reached Timbuctoo on 18 August 1826 and was murdered on September 26 in the desert to the north. Laing never saw his book of 'Travels . . . in Western Africa' completed: he left when the proofs had been printed up to the 144th page out of 465. The publication was supervised by his friend Captain Sabine. In Major Rennell's copy appear the words "From the Author" not apparently in Rennell's handwriting. Major Rennell's annotations, notably on the fly leaf, "Source of the Niger by Major Laing—see pp. 324,5,6 $\begin{cases}\text{Lat. } 9°34' \text{ N.}\\ \text{Lon. } 9.45' \text{ W}^t.\end{cases}$ About 220 G. Miles to the S.W. of the position given by Park," show the source of his additions to the Park map published twenty-seven years earlier. There are no annotations of Major Rennell's anywhere in the "Proceedings" bearing on Park's second and fatal journey in 1805 unless the new positions of Marraboo, Koolicorra (Kulikoro), Yamina, and Samee (Sami) on the Niger downstream of Bamakɔ, which have been referred to on Rennell's map, are derived from information received from Park in his letters, the last one of which was dated from Sansanding, 17 November 1803, the last communication received from him. Rennell's silence about Park's second journey is perhaps due to disagreement with Park that the Niger "could flow nowhere but into the sea." Rennell seems to have remained obstinately convinced that the Niger terminated in lakes or swamps somewhere in or east of Hausaland.

Bound into the writer's copy of the "Proceedings," opposite the map in question, are two sheets of paper in Rennell's handwriting and apparently to be dated about the same time as his annotations concerning Laing's journey, *i.e.* probably 1825. These two sheets are particularly interesting. The note is entitled "Concerning the Place of the *Head* of the *Joliba* River (or *Niger*); and of its general Course, above *Bammakoo*" and reads as follows:

> The following account of the Trade & Navigation of the *Niger*, & of the City of *Tombuctoo*, was procured on a Journey to *Galam* in about the year 1764, for a gentleman who was then Governor of *Senegal*,[1] by a Person who acted as his Arabian Interpreter.
>
> "Après bien des difficultés, j'ai enfin trouvé un homme qui est revenu de *Tombuctoo* depuis peu, qui m'a mieux instruit du pays que personne. J'ai parlé à plusieurs marchands, qui m'en ont compté quelque chose, mais je m'en rapporte mieux au dernier, qui en vient depui peu; qui m'a assuré que les bâtimens, qui naviguent dans la rivière de *Tombuctoo*, ne viennant point de la grande mer; que ce sont des bâtimens construit à *Tombuctoo*, qui sont

[1] Governor George Barnes.

consûs soit avec du cordage, soit avec de l'ecorce de coco, il ne le sait pas au juste; que ces batimens ne vont qu'au traite et à l'aviron. Il dit que ce sont des Arabes qui habitent la ville de Tombuctoo, que c'est une grande ville, que les maisons ont trois ou quatre étages. Il dit que les caravanes qui viennent à Tombuctoo, viennent du côté de *Medine* et apportent toutes sortes de marchandises, des étoffes, et des toiles blanches; que ces caravanes ne sont composées que de chameaux; qu'elles s'arretent à une demi lieue de Tombuctoo, et que de là, les gens de Tombuctoo vont acheter les marchandises et les apportent dans la ville; ensuite, qu'ils arment leurs bâtimens pour les envoyer a *Genné*, qui est une autre ville sou la domination de Tombuctoo, et que les habitans de Tombuctoo y ont des correspondans. Ceux de Genné arment à leur tour leurs bâtimens, et y mettent les marchandises qu'ils ont recus des bâtimens de Tombuctoo, et font monter leurs bâtimens à leur tour, et leur font monter la rivière. Il est à remarquer, que la séparation des deux rivières est à une demi lieue de Genné, et Genné se trouve entre les deux rivières, comme une isle. Une de ces rivières, court dans la *Bambarra*, et l'autre va a *Betoo*,[1] qui est und pays habité par un people rougeâtre, qui fait sans cess la guerre aux Bambarras. Après que les barques de Genné ont monté la rivière bien avant, ils trouvent la chûte de *Sootasoo;* où ils s'arrêtent, et ne peuvent plus passer. Lâ ils déchargent leur sel & leurs marchandises, et les portent à la autre côté de la chûte à dos d'ânes, et sur leurs têtes. Lâ ils trouvent les grandes piroques ces Negres, qu'ils fraitent, et montent la rivière avec ces piroques jusqu'à chez les *Mandings*, qui s'appellent *Malins*, qui sont proche du roche *Govina*."

Thus it appears that an English Governor of *Senegal*, as early as 1764, had learnt from what he deemed the best authority, that the course of the *Joliba* or *Tombuctoo* River (our *Niger*) was from west to east: and not only that fact itself, but also the detail of the navigation, and course of Trade thro' it *upwards*, from *Tombuctoo* to the Country of *Manding* or *Mandinga:* altho' it was believed by the Public at large to run to the West, until the discovery made by Mr. Park, in 1796. And even at that time, M. Lalande, the celebrated French Astronomer published a Trait to prove its westerly course.

The places of its source, & of its termination, were still unknown. The former indeed was vaguely pointed out to Mr. Park, at the distance of 7 Journies to the southward of *Karnaliak* (altho' it be in effect nearly three times as far to the southwest). Its termination has been supposed by some to be in the *Congo* River, but by others in the Egyptian Nile, a variation of 1300 miles, and still floats in uncertainty.

Its source may now be regarded as satisfactorily approximated, (in the view of *general* Geography), by the labours of Major Gordon Laing. In 1821 (?) he was sent by Sir Charles McCarthy into the *Soolimanee* & other Countries, to the north eastward of *Serra Leona*. He was shewn, at the distance of about 180 G. miles to the E.N.E. of *Serra Leona*, the Mountain of *Loma*, from whence the source of the *Joliba* River, was said to flow. This was indeed, about 220 G. miles more to the S.W., than the place pointed out to Mr. Park, by the natives in the opposite (North east) quarter; but it cannot be doubted that it was intended for the same place; because the place of the source was named *Sankary* to Park, *Sangara* to Laing; & moreover, the *Sankary* of the one, & the *Sangara* of the other, had, lying respectively to the westward of them, the Countries of *Solimana* and *Soolimana*.

[1] Probably this Name should rather be *Beroo* or *Beeroo*, as it appears in Park. Major Laing, in his way across the desert (in 1825) learnt that a River from the NW falls into the *Joliba* at *Gennee*, passing thro' the Country of *Masina*, in its way.

It is remarked by Mr. Barnes (a Son of the Governor) in his Appendix to Adams's Travels (1816), p. 200, that M. D'Anville names the country above the source of the River *Gambia* etc. "MANDINGA: *inhabited by the Soosoos*" whence it would appear that these two people (*i.e.* the Mandingoes & the Soosoos) were, in some measure, identified with each other. The Country and Language of the *Mandingoes*, according to Mr. Park, extended eastward beyond *Bammakoo*, on the Joliba; & Major Laing places a large division of it on the Sea Coast, near Serra Leona. Again, M. D'Anville says that *Songo* is the Capital of *Mandinga* which place in his Geography occupies a position that falls within the *Sangara* of Laing: and is probably intended for that place or Country.

Hence, one cannot doubt, from a combination of these Circumstances, that the head of the *Joliba*, (*our* NIGER) is really situated in the general position given by Major Laing: & that the Arabic Interpreter of Governor Barnes furnished a true Report concerning the detail of the Navigation of the *Joliba*, upwards, from *Tombuctoo* to the Country of *Mandinga*. And finally, that the upper course of it, (according to the position of its Source as given by Major Laing) must necessarily pass thro' the Country inhabited by the *Soosoos*, (according to M. D'Anville).

It is well known from Mr. Park, that the Navigation of the *Joliba*, upwards, *terminates* at *Bammakoo:* in which neighbourhood also, the Country of the *Mandingas*, so closely connected with the *Soosoos*, *commences*, from the eastward. Now, Mr. Barnes observes, that it appears probable that the Impediment, (of what kind soever it may be) which occurs at *Bammakoo*, may be *that*, called the *fall of Soosatoo* by the Interpreter: since it may be regarded as the *pass* or *entrance* into the Country of the *Soosoos*.

To what extent upwards, from *Bammakoo*, the *Joliba* may be navigable, for the Canoes (or piroques) of the Negroes, one has no means of knowing. It is the largest stream in that quarter of Africa, and derives from thence its Name of *Joliba*, or *the great Water:* altho' in the neighbourhood of its Source, it is named Tembie.[1]

[1] 'Major Laing's Travels,' p. 327.

DR. KNUD RASMUSSEN'S CONTRIBUTION TO THE EXPLORATION OF THE SOUTH-EAST COAST OF GREENLAND, 1931–1933: *A paper read at the Evening Meeting of the Society on 1 April 1935, by*

CAPTAIN GABEL-JØRGENSEN, Second-in-command of the Expeditions and officer in charge of survey operations

IN the summer of 1904, on his way home from Mylius Erichsen's "Literary Expedition" to West Greenland, Knud Rasmussen visited the Cape Farewell district. From the mouth of Prins Christians Sund he attempted to force a passage up the East Coast in a row-boat. Ice and bad weather between them made progress impossible. But, from the headland Aluk, Knud Rasmussen could see the gleaming mountains of the East Coast stretching far away towards the north, and inspired by the sight he resolved to visit again this part of Greenland's imposing coast.

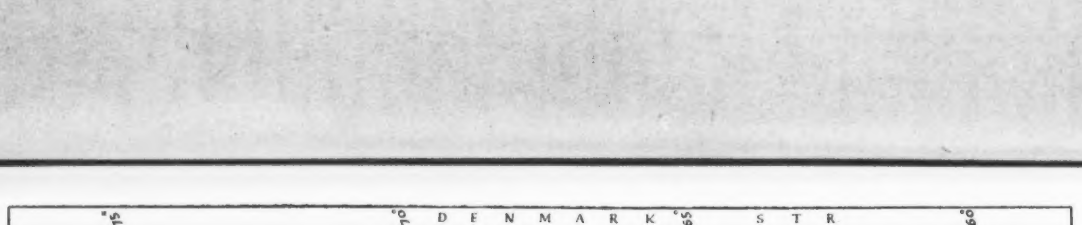
But many years were to pass before the wish was realized. Nor did it happen quite as first planned. In 1919 Knud Rasmussen came to Angmagssalik with one of the government ships on the regular yearly voyage. During the short month that was available to him, while the ship, having discharged her cargo, went to Reykjavik for bunkers, he recorded industriously a number of the myths and sagas of Eskimo folklore; these were later published in a well-known book: 'Eskimo Folk-tales' (London 1921).

That was the Fourth Thule Expedition, the smallest of them all. By its means Knud Rasmussen's knowledge of the East Coast became extended and his resolve to get to know it better on a more thorough expedition was strengthened. Year after year he studied the ice-reports—not only the official ones but also those he obtained directly from his many friends among the Angmagssalik and Cape Farewell Greenlanders. As the years went by the surprising fact revealed itself that the conditions were improving from summer to summer, and at length appeared to be so good that the time could be said to be ripe for action. A further decisive circumstance which urged to action was the political conflict in East Greenland, a conflict which though at first only concerned with North-East Greenland might later extend to include the south-east coast as well. He freighted a fast motor-boat to Julianehaab, whence with a few comrades he started the voyage to Angmagssalik and back. The experiment succeeded. It became the Sixth Thule Expedition.

It is the drift-ice which characterizes the East Coast. Ice-floes innumerable are borne southwards along the coast by the Polar Current. They lie along the whole length of the coast blocking every approach and forming a menacing, dangerous barrier which in the course of time has repulsed so many attempts to reach the coast from seaward. The only sure means of forcing a way along the coast itself seemed to be the *umiak* or women's skin-boat. These were the craft employed by Graah in 1828–31 and Holm and Garde in 1883–85; but all are familiar with the great difficulties encountered by these explorers in the drift-ice, when it was a matter of months to make passages which later could be made by steam in as many days.

Knud Rasmussen

60°
50°
40°
30°
20°
75°
70°
65°
60°
GREENLAND
DAVIS STR.
DENMARK STR.
C. York
Upernivik
Ilmanak
Disko
Disko Bay
Jakobshavn
Holsteinsborg
Godthaab
Ivigtut
Julianehaab
Nanortalik
Ikek
Cape Farewell
Pikiutdlek
Ilmivik
Skjoldungen
Tingmiarmiut
C. Tordenskjold
Lindenow Fj.
Pr. Christians Sd.
Angmagssalik
Kangerdlugsuatsiak
Tugtilik
C. G. Holm
Mt. Forel
Nualik
Kangerdlugsuak
Atkis Fj.
C. Dalton
D'Aunay B.
C. Daussy
Blosseville Coast
Gaasefjord
Scoresby Sd.
Harry Inlet
Scale of Miles
50 0 50 100 150 200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The Sixth Thule Expedition

The voyage of the Sixth Thule Expedition was begun in Julianehaab on 19 August 1931. A course was laid through Prins Christians Sund to the East Coast, and thence northwards to Skjoldungen, where investigations were made during the period August 24–30. A direct passage was then made to the colony Angmagssalik, which was reached on September 1. For the first time a motor-boat had traversed the stretch of coast from Cape Farewell to Angmagssalik.

The return voyage began on September 6, and was immediately followed by a serious accident which came within a hairsbreadth of costing the lives of the entire expedition. Off Umivik a tempestuous storm got up suddenly; big seas carried away the dinghy, smashed the rudder, and damaged the propeller. The boat was driven far out into Denmark Strait before the naval crew, under Captain Bangsbøll's command, succeeded in making the ship manageable again. The boat was repaired from her own resources in Skjoldungen and the journey southwards continued on September 19. After making a number of landings along the coast, Narssaq in Lindenow Fjord was reached on October 1. On October 2 Augpilagtoq was reached and, as far as the East Coast was concerned, the journey ended.

The Sixth Thule Expedition was first and foremost a reconnaissance tour and as such was most valuable. The other results obtained must be judged in the light of this fact. The most important of the scientific results are the magnetic observations made by the meteorologist Dr. Johannes Olsen. At eighteen stations along the coast determinations of the variation and of the magnetic vertical and horizontal components were made. Magnetically, this part of the East Coast is better known than any part of the West Coast. In Lindenow Fjord Magister Holtved made a number of archaeological excavations in which twenty-five houses were examined and some two thousand specimens collected for the National Museum.

The establishment of the fact that one could travel along the East Coast in a motor-boat naturally had a revolutionary influence on the technique and plans of any later expedition. But the motor-boat was not the only new instrument. The effective use of the aeroplane on Watkins' British Arctic Air Route Expedition, 1930–31, had opened entirely new prospects: it was now possible to see beyond the first range of mountains—the extension of vision which had been the desire of every explorer had at length been realized. This freedom of movement both on the water below and in the air above made it possible to use the short summer much more intensively than hitherto. Unfortunately only July, August, and September are available for the work of a summer expedition; until July the ice is not open enough and after September storms and rain put a stop to field-work.

With these facts before him Knud Rasmussen set to work in the autumn of 1931 to plan a thorough investigation of the south-east coast from Cape Farewell to Scoresby Sound. It was a task which he hoped to complete in the course of three summers' work, thereby avoiding costly winterings. With the technique at his command it was possible to formulate an ambitious programme which would extend over a great length of coast. The final expedition of 1932

comprised thirty-seven Danes and twenty-eight Greenlanders in continual employment. For transport there was one large ship, the M/S *Th. Stauning* (mother-ship), seven larger or smaller motor-boats, and a seaplane borrowed from the Danish Navy.

The coast-line to be investigated was that between Cape Farewell and Umivik: a stretch about 350 miles long and on the average 45 miles wide between coast and inland-ice. It is a desolate and barren coast of ice and mountains, varying in its appearance from the rounded forms of the inland-ice to peaked alpine ranges.

The tasks before the expedition of 1932 were: (1) survey in conjunction with air photography, the principal task of the expedition; (2) geological, (3) archaeological, and (4) marine biological investigations.

The Seventh Thule Expedition, 1932

It must be realized that it is a matter of some difficulty to give a short account of the two expeditions of 1932 and 1933—both of which were called the "Many Journeys" expeditions with justification. In 1932 Knud Rasmussen was the first to depart. He went up with one of the government ships to Julianehaab. Here he himself made all the further preparations, and on June 28 he was joined by the principal group of the expedition, which had left Copenhagen on the *Th. Stauning* ten days before. Circumstances now obliged Knud Rasmussen as "Protector" of Dr. Fanck's cinematograph expedition to go to Umanak Fjord on the West Coast; furthermore the *Th. Stauning* had to carry out the annual voyage to the Thule Station at Cape York. The rest of us therefore came ashore while Knud Rasmussen joined the ship on her continued voyage; he did not expect to be back before the beginning of August, when the survey flights should begin.

Thus it was only a brief meeting with Knud Rasmussen. Soon the *Th. Stauning* sailed northwards while the rest of the expedition, under the leadership of the second-in-command, prepared the boats for the journey to the East Coast. The party left Julianehaab on July 5 in three motor-boats. After some difficulties with the ice, particularly in Prins Christians Sund, we slipped through the southern channel Ikeq and so were free to steer northwards. Luckily we met no ice that was heavy enough to hold us up altogether. The first check was made in Tingmiarmiut, where the survey, Norse-archaeological, and geological work began. Here Dr. Poul Nørlund, in charge of archaeology, separated from the main party and worked southwards again, while the rest continued the cruise northwards so as to meet the *Th. Stauning* in Skjoldungen during the first week in August according to plan.

On the way to Skjoldungen we met with a serious misfortune in that the engine of the biggest motor-boat collapsed; there was nothing for it but to tow the boat the long way back to Julianehaab. We remained on the East Coast with no more than a little motor-boat for a party of ten men, which looked like a disaster for the programme of work.

The long-expected meeting with the mother-ship took place on August 7 in Skjoldungen Fjord. The aeroplane, which had been conveyed to Ivigtut and there put on board the *Th. Stauning*, was now a great help. It was sent up to locate the motor-boat and found it in ten minutes, so that soon we were

once more all together. With shrewd foresight Knud Rasmussen had brought a new motor-boat with him and presently we were dispersed in all directions to begin the final spurt.

Two surveyors and the geologist went in a motor-boat to map the stretch southwards from Tingmiarmiut, while another group went northwards to map the stretch between Umivik and Tingmiarmiut. Dr. Therkel Mathiassen was fetched from Angmagssalik and began excavations in the Skjoldungen district. Dr. Knud Rasmussen himself directed the survey flights from the mother-ship and in addition made motor-boat voyages of investigation to the former Eskimo dwelling-places in the company of the old East Greenlander Christian Poulsen, hunter and wiseman. Thus there was much done in many fields. In the course of August the flying group succeeded in completing the survey flights from Pikiutleq in the north to Cape Farewell in the south, after which the *Th. Stauning* was free to sail to Copenhagen. The survey party ended their fixing of ground-control in the middle of September and the last boat arrived in Julianehaab on September 18 after a successful voyage. As with the journey out to Greenland, so the return voyage took place on various ships as opportunity offered, Knud Rasmussen himself arriving in Copenhagen on November 4.

The principal results can be referred to briefly. The survey work was led by Captain Gabel-Jørgensen. One hundred and thirty-seven stations were occupied; astronomical observations, base measurement, and triangulation were carried out, and the position of some four thousand points determined. It was possible to build up a network of fixed points both along the outer coast and farther inland: these will serve as ground-control for the many stereoscopic air photographs. The survey group further undertook in the Julianehaab district a series of tidal observations for the determination of the Mean Sea-Level in relation to that determined by Holm and Garde in Nanortalik in 1883–85.

The air-survey photography was in charge of Lieut. Erik Rasmussen, of the Danish Navy. About one thousand five hundred photographs were taken; partly as strips of high obliques taken at 13,000 feet with the camera axis abeam and inclined at 20° to the horizontal, photographs which would later be used in pairs in the plotting machine; partly as single pictures taken astern along the line of flight with rather greater inclination at 10,000 feet.

The mother-ship occupied in all six flying bases at different points along the coast; she could with ease swing the flying machine out on to the water with derrick and winch, and just as easily swing it on board again after the flights were finished. The machine used was a 3-seater Heinkel seaplane Type II (a low wing monoplane) equipped with a single 400-h.p. Jaguar engine, which gave a cruising speed of 105 m.p.h. (maximum speed 130 m.p.h.). The machine was in many ways well suited to the work, but the action radius (400 miles when loaded) and maximum speed were both rather low for Greenland conditions. On the East Coast 7000 miles were flown, and if the flights on the West Coast are included a total of 12,000 miles is reached for the summer, during which no accident or failure of any importance occurred. The camera used for the survey photography was the Eagle Mark III, manufactured by Williamson of London; it was on the whole satisfactory.

The geological work was carried out by Magister R. Bøgvad, who investigated the district from Cape Farewell to Imarsivik and visited Krumpen's Fjord and Umivik. A quantity of material for petrological investigation was brought home from the coast. As is well known, the coast here consists of various kinds of gneiss and granite containing younger syenites and basic dykes. Besides quaternary deposits and altered sediments in the gneiss, no sedimentary formations were found. Raised beaches at times as high as 25 m. above sea-level were seen; but a recent sinking of the land was testified by the evidence of Eskimo house-ruins, *e.g.* in Anoretok Fjord. In many places in the glacier valleys immediately above the ice, a greater or smaller band of rock was found still bare of lichens, indicating a recent general retreat of the ice. The geologist further collected plants (see *Medd. om Grønl.*, vol. cvi, no. 3), insects, spiders, etc., from about one hundred localities.

Dr. Poul Nørlund searched the coast at a great many points for traces of the Norsemen, but with negative results. The only indubitably Norse ruin on the East Coast proper is now as before Rolf's Ruin, in Lindenow Fjord. Even here Dr. Nørlund does not suppose that there was any permanent colonization, but thinks that outcasts or shipwrecked people have made it a temporary habitation. Accidental evidence alone can give a fuller story of the Norse life on the East Coast: systematic investigation gives too slender results for it to be worth while. Dr. Nørlund's journey was not however completely negative in its results, for he found on the north side of Ikeq two small previously unknown Norse farmhouses which are now the most southerly known.

It was to Dr. Knud Rasmussen's great pleasure that his archaeologist and comrade from the Fifth Thule Expedition, Dr. phil. Therkel Mathiassen, could complete his investigations into the culture of the Angmagssalik Eskimos by joining the Seventh Thule Expedition. Therkel Mathiassen immediately threw himself into the investigation of an interesting ruin very unlike other Eskimo houses which Dr. Knud Rasmussen had discovered in 1931 deep in the Skjoldungen Fjord. Altogether twenty-one houses were excavated and in Knud Rasmussen's company so many former Eskimo dwelling-places visited that the history of the population of the coast now stands clearly defined.

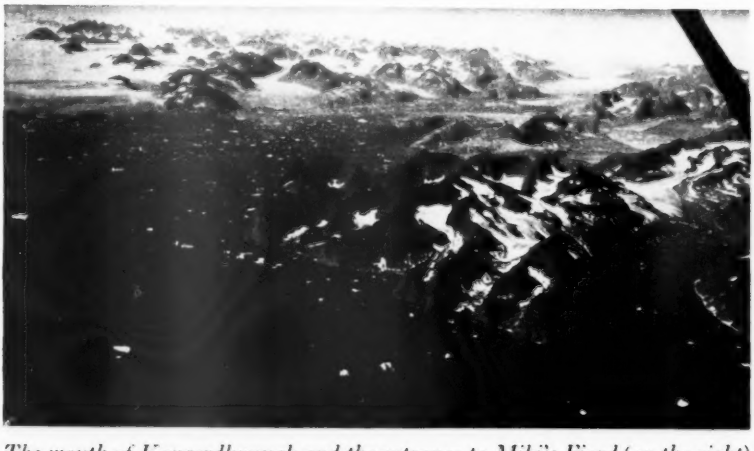
Magister Poul Hansen, who for a number of years has been in charge of fishery research on the West Coast, in August extended his researches as far as Lindenow Fjord. The results obtained were hardly encouraging, since fish are nowhere to be found in any quantity because the water is too cold and the biological conditions too unfavourable. Only sharks were to be found in any number, and these had an exceptionally small liver. Two members of the expedition, Emil Rasmussen and Knud Østergaard, were left at a little house in this fjord, Tutein's House, for the winter, in order to get a better idea of the hunting conditions. Knud Rasmussen's own work on this expedition will be considered later.

Seventh Thule Expedition 1933

Here the task was to continue from the point where the expedition of the previous year had left off. The aim was to map and investigate the stretch

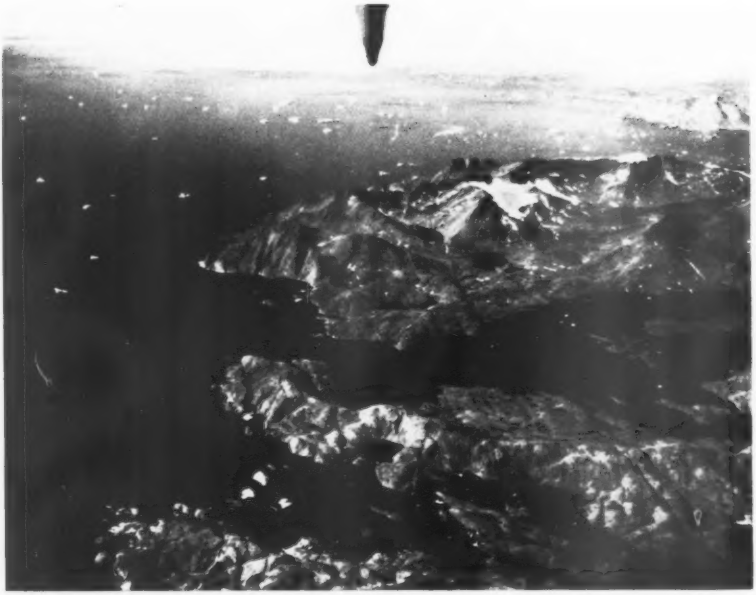
The inner district of ice-flooded ranges north of Mount Forel

The low-lying ice-planed islands between Umivik and Angmagssalik



The mouth of Kangerdlugsuak and the entrance to Miki's Fjord (on the right)

Cape Tordenskjold



Tasiussak and Angmagssalik Settlement seen from 13,000 feet

between Umivik and Kangerdlugsuak, and to make a connection with the work of Captain Einar Mikkelsen's expedition of 1932. If possible the last stretch, from Kangerdlugsuak to Scoresby Sound, would be reconnoitred and preparations made for an easy conclusion to the programme.

A new, vast, and very interesting length of coast-line lay before the expedition. From Umivik to Kangerdlugsuak is 375 miles and thence to Scoresby Sound another 375 miles. An average breadth of the district between coast and inland-ice would be about 60 miles. This coast can be said to be divided naturally into four very different sections, which are:

(1) *Umivik to Sermilik Fjord.*—The inland-ice extends here right down to the coast. Such land as appears has low and rounded contours, evidently shaped by the ice. Along the coast lies a disperse system of islands and rocks, indescribably barren to see.

(2) *The Angmagssalik District.*—This is the country of alpine scenery. It is an arresting confusion of airy peaks. There are great mountain chains separated by deep valleys or fjords. The inland-ice lies a long way from the the coast and there is a series of islands along the coast which in the summer are free of snow and sometimes even verdant.

(3) *Kangerdlugsuatsiak to Kangerdlugsuak.*—Knud Rasmussen called this the most desolate coast he had seen in Greenland. The mountains, as though in strife with the inland-ice, rise vertically out of the sea to form a narrow bulwark with rifts, through which productive glaciers pour out quantities of ice. There is hardly a single island or bay where even small craft may find shelter, while submerged rocks in abundance make navigation dangerous.

(4) *Kangerdlugsuak to Scoresby Sound.*—This coast is typified by the dark-coloured basalt mountains. Cape follows cape, the one separated from the other by a large glacier debouching into a short fjord. This coast, of which the Blosseville coast is a part, is also barren and has few harbours; in its southern part the mountains rise so steeply from the sea that even where a lee can be found, landing is practically impossible.

It was in fact, as the above shows, a field of work to be entered cautiously. The programme had moreover been enlarged to include a greater scope than that of the previous year. The tasks before Knud Rasmussen's expedition of 1933 were classified as follows: (1) Principal object—survey in connection with air photography. (2) Official inspection of the coast between Cape Farewell and Kangerdlugsuak. (3) Special research into the culture, religion, and folklore of the East Coast Eskimos. (4) Geological and (5) Glaciological investigations. (6) Fishery research. (7) Zoological investigations. (8) Botanical collection. (9) An artist's impression of the coast and the people. (10) A cinematograph film of East Greenland and the Eskimos.

This comprehensive programme demanded a correspondingly great rally of personnel and material. Altogether there came with the expedition forty-five Danes, one Englishman, and four Germans: in Greenland a further hundred Greenlanders were assembled from the Cape Farewell and Angmagssalik districts. Eventually it was by far the largest expedition that Knud Rasmussen had ever taken into the field: the contrast with 1919, when he travelled up alone on the Fourth Thule Expedition, was striking.

There were also alterations in the flotilla from that of the previous year.

The motor-boats were much better. There were altogether seven of these, some larger, some smaller. But on the other hand it had been impossible to charter the *Th. Stauning* again and the expedition had to be satisfied with the much less powerful motor-schooner *Nordstjernen*, which, with a naval crew under Captain Vedel's command, carried out the combined duties of inspection and expedition ship. The *Nordstjernen* carried the same seaplane as had been used in the previous year. If the expedition of 1932 was the "Many Journeys" expedition, then that of 1933 was the same in even greater degree.

The first goal of the expedition was Angmagssalik. The expedition became very much dispersed during the various voyages to Greenland: the surveyors had to go first to the West Coast in order to fetch their boats. Knud Rasmussen's new arctic motor-ketch *Kivioq* (22 tons) sailed direct for Angmagssalik soon after the surveyors had left. Finally the main part of the expedition, led by Knud Rasmussen personally, left Copenhagen on June 24 on board the *Nordstjernen* for Angmagssalik *via* Reykjavik. All these journeys went more or less according to plan. Knud Rasmussen made the last part of the voyage from Reykjavik on the *Kivioq* and was delayed in the ice for a few days; *Nordstjernen* was the first to arrive, on July 12, while the *Kivioq* arrived a day later.

Things did not go quite so well for the survey party. The crews of their motor-boats had gone early in the year to Holstensborg and Julianehaab to prepare the boats, and the four surveyors had left Copenhagen on May 25 with one of the government ships bound for Julianehaab. But the ship could not get in to Julianehaab on account of ice and the party was finally put ashore on June 4 as far up the coast as Godthaab, whence we had to manage to work our own way in one motor-boat through the ice to Julianehaab, which was reached on June 14.

A misfortune now occurred. Motor-boat No. 2 had serious engine trouble which caused further delay. The time was spent in making a photogrammetric survey of Julianehaab Fjord. Not until June 30 was it possible to begin the journey to the East Coast. The cruise went by way of Nanortalik and Frederiksdal, where the Greenlanders joined the party, and thence through Prins Christians Sund, which in spite of large quantities of ice outside was itself comparatively free of ice, in contrast to the previous year.

We stood out of the fjord on July 4 in the most beautiful summer weather and made course for Lindenow Fjord, anxious to meet the two men who had wintered, but of whom nothing had been heard since the autumn. Happily all was well, and our anxiety was now to continue the voyage as soon as possible northwards. But misfortune dogged us again; the ice blocked up the mouth of the fjord so that we were imprisoned for some ten days; not until July 6 was it possible to continue. But this time our luck had changed and in spite of much ice we made such good progress that early in the morning of July 21 we stood in to Angmagssalik harbour. The next day the aeroplane arrived from Ivigtut (where it had been landed from the Danish inspection ship *Hvidbjørnen*) and now we were all assembled for the work of the expedition.

However interesting it would be to follow the progress of this work, space forbids more than a short account. From Angmagssalik the many groups dispersed over the neighbouring district. Activity developed on all sides:

flying men, surveyors, photographers, boat-skippers, collectors, and mountain-climbers all began to work. At the centre of everything was Knud Rasmussen, directing and co-ordinating.

We may now immediately consider the results.

Survey.—The survey work was carried out under the same leadership as in the previous year and was completed according to programme. The surveyors succeeded in fixing a network of points in a continuous and for the greater part well-conditioned system extending from Umivik in the south to Kangerdlugsuak in the north. Not only were numerous control points fixed, but some four hundred stereoscopic photo-pairs were taken from terrestrial stations distributed over the whole stretch. These surveys were carried out by Gabel-Jørgensen, Th. Pedersen, M. Spender, and Chr. Larsson, of whom the last two had taken part as surveyors on Captain Einar Mikkelsen's expedition in 1932. The party was divided into two groups, which, assisted by several Greenlanders, sailed from station to station along the coast until they re-assembled in Angmagssalik in the middle of September after a successful summer's work. On the homeward journey along the south-east coast some supplementary stations were occupied in the district surveyed in 1932, after which the two boats together entered Prins Christians Sund on September 29 and ended the voyage on October 3, when they arrived in Julianehaab.

Besides the survey of Julianehaab Fjord already mentioned, new and comprehensive tidal observations were undertaken on the West Coast in Nanortalik and in Julianehaab. At the latter place Spender erected before our departure a self-registering tide-gauge which had kindly been placed at the expedition's disposal by the Royal Geographical Society. This, the first automatic tide-gauge to be set up in Greenland, worked practically without interruption until July 1934; the results, which are now being worked out, will doubtless be interesting.

The air photography, part of the survey work, was again under Lieut. Erik Rasmussen. Two thousand miles of photo-route were flown and some five hundred stereo-pairs obtained, besides a number of single photographs. These were technically considerably better than those of the previous year. Not only was the stretch from Umivik to Kangerdlugsuak photographed, but photography was also extended as far as Cape Daussy on the Blosseville Coast.

This great mass of material has been handed over to the Geodetic Institute in Copenhagen. It has already been possible for the Institute, on the basis of the points surveyed during Captain Einar Mikkelsen's expedition, to make a map from the air-photographs of the Seventh Thule Expedition over the whole of the enormous mountain and ice tract which extends from Kangerdlugsuak in the direction of Gaase Fjord. This map covers therefore the gigantic massif, the highest in Greenland, which lies some 50 miles inland from the coast at Cape Nansen. The highest peak plotted in the aerocartograph had a height of 12,200 feet above sea-level.

The schooner *Nordstjernen* was mother-ship to the flying group, and that was her principal function. Her base was sometimes in Angmagssalik Fjord, sometimes in Mikis Fjord.

In concluding the account of the survey I cannot refrain from expressing

the greatest admiration for the map-making carried out by the Danish naval officers of the earlier boat expeditions; in particular the work carried out by Graah, Holm, Garde, and Amdrup on Greenland's south-east coast. Those familiar with the coast and modern technique can only be astonished at what these men succeeded in doing with much less accurate instruments under much greater difficulties, handicapped as they were by inadequate transport and the perpetual menace of the ice.

Geology.—The geological investigations were continued this year by Magister Bøgvad. He worked in the district between Oxe Fjord (gneisses with later granites and basic dykes) and Mikis Fjord, and had opportunity to visit the basalts of the Blosseville Coast at several points. He succeeded in bringing home a collection of fossils from the sedimentary deposits, the southernmost in East Greenland, at Cape Gustav Holm. These were first located by Lawrence Wager while working a few years earlier in the same district (see *Medd. om Grønl.*, vol. cv, no. 2). The age of the deposits is judged as being late cretaceous or tertiary. On this stretch also raised beaches up to 20 m. in height (*e.g.* in Kangerdlugsuatsiak) occurred. In Mikis Fjord erratic boulders were found at an altitude of 700 m. above sea-level, indicating a previously very great extension of the ice. Botanical collections were also made by the geologist in some seventy localities, while insects, spiders, etc., were taken in sixty localities.

Glaciology.—The glaciological investigations were made by Magister Milthers, who chose eleven glaciers in the Angmagssalik district for investigation. The main part of this work took the form of a photogrammetric record of the processes in operation at a glacier tongue. Such records were made at four glaciers. Altogether five glaciers can be mapped so as to give a precise description of their present condition. All these showed signs of retreat over a period of years, and it was typical to find an end-moraine about 100 yards beyond the present position of the snout. Special attention was also paid to the emergence of moraine from the muddy bands which lie parallel to the so-called *Scherflächen*: a problem which has bearing on the development of moraines during the melting of the Pleistocene ice-sheets. The ablation at the front of a typical glacier during a period of forty-eight days amounted to between 118 and 142 cm.

The expedition contributed also in another way to glaciological research, in that the air-photographs give an excellent picture of the conditions at the margin of the inland-ice; moreover the instantaneous record contained in the air and terrestrial photographs of the present state of the glaciers of the entire coast is in itself of great value for future researches.

Fishery research.—This was carried out by candidate Bertelsen and took place at various stations in the Angmagssalik neighbourhood and in Uttental Sound in Kangerdlugsuak. Soundings, water-sampling, tow and trawl-nets, and various methods of fishing have been employed. Further two hundred codfish were marked. Even if this material is far from fully worked out, it is already apparent how remarkably the marine life varies from fjord to fjord along the coast. The poverty of conditions in Lindenow Fjord has already been mentioned. But as far north as Kangerdlugsuak, particularly in Uttental Sound, a great richness of life was displayed, both seals and fish being plentiful.

Zoological research.—This comprises in the main Magister Marie Jørgensen's studies on the soil microfauna. The object of these researches was to determine whether the land had a similar ecology to that of the sea. If this should be so, then more detailed researches would be pursued with a view to clearing up some controversial points on the question of the mode of immigration of certain animals into Greenland. A number of earth-samples were taken in the Angmagssalik and Mikis Fjord districts, after which the microfauna were extracted by means of Berlese funnels. The results exceeded all expectations as to the density of this type of life; but though the number of individuals was considerable, the number of species was restricted. Life in the lakes was poor and there were very few species.

The ornithologist U. Møhl-Hansen travelled extensively over the coast from Skjoldungen to Scoresby Sound making investigations and collections. Interest was centred on collecting the smaller land and wading-birds, of which a great number were taken for species determinations. The question of feeding habits were also looked into and the stomach contents of both birds and mammals collected.

On the whole the south-east coast is poor in bird life. There are but few fowling-cliffs, of which the largest only contain some fifty nests. The ornithologist reports having seen many seals and dolphins, but only two polar bears.

Conclusion of the expedition.—The above summary of the work of the expedition does not include Knud Rasmussen's personal contribution; this will be considered later together with his work on the other East Coast expeditions. But the ending of the programme in Greenland will be briefly described to round off the account of the work done. We first felt the time was nearing for the homeward journey when on September 7 the inspection ship *Hvidbjørnen* arrived in Mikis Fjord from Reykjavik in order to convey the aeroplane to Reykjavik, whence it was freighted home. In mid-September the two survey motor-boats started the voyage south round Greenland so that they should reach the West Coast in time to be laid up; at about the same time the small open motor-boats were taken out of service since the equinoctial storms had begun.

On September 20 the *Nordstjernen* sailed from Angmagssalik with the greater part of the expedition on board as well as Messrs. Rymill, Riley, and Chapman, the survivors of Watkins' expedition to Tugtilik (Lake Fjord). There remained Knud Rasmussen himself, the film-group, who still had some scenes to shoot, and the geologist Bøgvad, who also still had some work to do. These last would travel to Julianehaab on the *Kivioq* and then take a passage home with a government ship. The *Nordstjernen* arrived in Copenhagen on October 18. But appalling weather with rain and storm much delayed the work of those who were still in Greenland. The survey boats eventually reached Julianehaab on October 3, but even by that time the film people were not ready to leave Angmagssalik. A further embarrassment was Knud Rasmussen's illness, an illness which probably began as food-poisoning and later developed into influenza and pneumonia; but his condition improved so much that the doctor gave him permission to sail on the *Kivioq* to Julianehaab.

At last, on October 12, presumably later than any other ship, the *Kivioq* left

Angmagssalik. Her commander, Lieut.-Commr. Tegner, favoured by moonlight, took the bold decision to sail day and night on a direct course for Prins Christians Sund, which was safely reached on October 14, fortunately without meeting any ice *en route*. The expedition thus finally left the coast a little more than three months after the brilliant early days of July when the first of the boats had ventured into the ice. Knud Rasmussen soon after his arrival in Julianehaab was picked up by the government ship *Hans Egede*, homeward bound from the northern colonies in West Greenland. On October 24, in overcast south-westerly weather, he left Greenland for the last time. The ship made a good passage and reached Copenhagen on November 4. Knud Rasmussen was weak and exhausted; but, since it was his wish, he went ashore over the gangway unassisted. The waiting ambulance took him from the quay to the hospital from which we hoped he would soon emerge with his usual radiant health regained.

But the expedition was not yet completely ended. A small group of film photographers had been left in the Cape Farewell district to make pictures of the kayak-men and hunters who live there: it had long been a wish of Knud Rasmussen's to be able to show their magnificent skill and absolute fearlessness by a series of film-pictures of the kayaks in stormy weather. This film party met with the curious misfortune of failing to get weather bad enough for them to be able to complete their task. In spite of the time of the year and the fact that Cape Farewell is one of the world's stormiest corners, it simply did not blow hard enough. At length, on December 10, the last members of the expedition reached Copenhagen, and thus ended the expedition so appropriately called by Knud Rasmussen "The Many Journeys Expedition to the Thousand Glaciers Coast."

Before considering Knud Rasmussen's own work in the field it is worth recalling the work done during the preparation of the expeditions. The ambitious programme for the investigation of the south-east coast had been his own idea. He threw himself with a glowing enthusiasm and tremendous energy into the extraordinarily involved problem of finding the ways and means to set into action the complicated machinery which characterizes a modern expedition. For months he was occupied in going from meeting to meeting until one detail after another was satisfactorily settled. But even for Knud Rasmussen it would have been impossible had not many public and private institutions united then as before to support him. Knud Rasmussen himself, through the Thule Station, gave the greatest economic assistance; but the State, the national scientific funds, and many private individuals have helped generously, especially for the last expedition which was of a size that no single individual could have managed without assistance.

I am inclined to think that the Sixth Thule Expedition in 1931 was, in spite of everything, the one on which Knud Rasmussen felt himself most in his element. This was an adventurous journey which in its boldness and simplicity had something of the atmosphere and flexibility of a sledge journey; only here the sledge had become a boat and the dogteam a modern paraffin-burning engine's horse-power. Knud Rasmussen's journal from this voyage shows how he was fascinated by the wild beauty of this coast he was

seeing for the first time. But an experience wider than his own senses could give him was to be obtained through the rich memories of his comrade the old East Greenlander Christian, whose real name was Autdaruta Angervarsik Qitdakajak, which means little more than the mother's expression of love and admiration for her child which the words really are. It was here that this independent-spirited old hunter had been born, and here on the East Coast he spent the prime of his life; his tales seemed to bring new life into the dead and deserted fjords and recalled the days of Knud Rasmussen's first meeting with the East Coast "heathen" in 1904.

The coast was covered stretch after stretch with old Autdaruta. In this way Knud Rasmussen obtained an exceptional insight into the past life of the coast as well as into the present hunting conditions, which had a special interest for him. Throughout the voyage valuable knowledge of the sailing and ice-conditions along the coast was collected, and it can be said with full justification that this reconnaissance journey was successful.

As far as Knud Rasmussen was concerned 1932 was rather a broken year. First of all a whole month had to be given up to visiting Dr. Fanck's film expedition in Umanaq Fjord; for Knud Rasmussen felt it his duty to make sure that at least the Eskimo scenes in this first fiction film ("S.O.S. Iceberg") from Greenland should be absolutely genuine. When at length he arrived on the East Coast he began to feel what a great burden rests on the shoulders of the leader of a large expedition.

But the flying was something new and stimulating. He remained therefore on the mother-ship for the first part of the time so that the survey flights should be carried out properly. Not until then could he apply himself to his own interests, namely archaeology and folklore: then, in the little motor-boat *Manne*, he went tour after tour from the mother-ship hunting for signs of past life and present resources. Especially interesting for him was Therkel Mathiassen's excavation of the house which had seemed to him so different from the Eskimo model that he had arranged for its investigation. On all these journeys old Autdaruta was a companion indefatigable in his recitation either of adventures from the old days when there were people on the coast, or of myths and sagas which had been handed down through countless generations. Knud Rasmussen took part in many flights and often saw the land from above. The limitless range of the views impressed him so much that he concluded the summer's work by a flight over the southern part of the inland-ice, from Lindenow Fjord to Julianehaab.

1933

The scheme for the expedition showed that there were apart from the leadership three groups of work which were Knud Rasmussen's own. Of these the first was the special study of the intellectual culture of the East Coast Eskimos: the second was to create an artist's impression of East Greenland and its people in words, line, and colour: the third was the film. All these required for their successful completion that peculiar combination of artistic and scientific sensibility which Knud Rasmussen could bring.

Immediately after arriving in Angmagssalik on July 13 Knud Rasmussen went ahead with the arduous task of getting the film started. A short description

of the film, "Palo's Wooing," is possibly not out of place here. Already on the Fifth Thule Expedition Knud Rasmussen had pressed moving pictures into his service, so that all should afterwards be able to participate in the especial beauty of the Arctic and its strange, hardy people. On all the later journeys a film was taken as a matter of course as part of the record of the expedition; so though it was with the Fanck film that he first had anything to do with fiction it was no novelty for him to take an active part in such work, especially as his only wish was to make the film genuine, Greenlanders playing a natural rôle in their own surroundings. The scenario for "Palo's Wooing" was written during the winter 1932/33. It is a simple and charming tale of the rivalry of two young Eskimo hunters for the hand of the prettiest girl in the settlement. The action is supposed to be taken straight from the daily life of the Angmagssalik Eskimos just before their discovery in 1884.

Knud Rasmussen was fortunate enough to get into touch with the experienced German film-producer, Dr. F. Dalsheim, the creator of the nature films "Africa Speaks" and "Bali—The Island of Demons." Furthermore he had with him two of Germany's best film-photographers, Scheib and Traut, and the group was completed by the East Greenland artist and "Overkateket" Karale Andreasen, who became a most invaluable colleague.

The difficulties in making the film were extraordinary. Everything had to be crowded into three months, and one simply had to go out and hunt for the right cast. The business of the film not only coloured the day-to-day life of the expedition but set its mark on the whole Angmagssalik district that summer. Knud Rasmussen himself had to keep at it for weeks on end. Together with Karale he carefully superintended the shooting of the scenes, and these two were the real and indispensable connection between producer and actors. The language difficulties were naturally considerable. Knud Rasmussen translated Dr. Dalsheim's German into the dialect of West Greenland for Karale, who translated it into the East Greenland dialect for the actors. A little of the original meaning was naturally lost at every stage, and in any case such a roundabout process delayed the work considerably.

The Greenlanders showed themselves to be natural actors and were soon so used to the imposing machinery of photography that they could play their parts without being unduly conscious of the circumstances. All showed enthusiasm for the film work, all except the weather. That the weather was so bad was serious: for long periods it rained in such quantities that the camp was often nearly washed out. But all were agreed against giving up and, in spite of the weather and later Knud Rasmussen's illness, they struggled through and finally in the first week in October could report their task completed. "Palo's Wooing" was Knud Rasmussen's last work. He did not see a single foot of his film himself. The first public display was in Copenhagen on 5 March 1934. I believe the film fulfilled in the main the great hopes he had set on it: it gave a true and charming picture of East Greenland and of the life, struggles, and beliefs of its people.

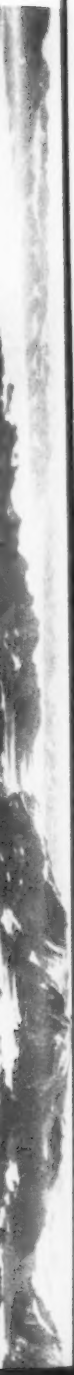
The Journey along the Blosseville Coast

It had been Knud Rasmussen's wish to see the whole of the East Coast with his own eyes. He therefore planned a journey with the *Kivioq* from Angmags-

A scene during the making of the film

Colonel and Mrs. Lindbergh say good-bye to Knud Rasmussen at Angmagssalik

Greenland's highest mountains, north of Mount Forel



salik to Scoresby Sound and back again, a journey which also had other objects, of which the principal was for the *Kivioq* to take over the duties of supply ship to the aeroplane for the photography of the final section from Cape Daussy to Scoresby Sound. Furthermore the film required some hunting scenes, if possible the hunt of a bear by a native. So that in all, with the geologist and the ornithologist, it was twelve men who started on the long voyage in the little ship.

The departure took place on August 14, and the cruise went first to Tugtilik (Lake Fjord)—where Watkins' Expedition was visited—and thence to Mikis Fjord. Here there arrived also at the same time the *Nordstjernen* and one of the survey motor-boats, so that a considerable portion of the expedition was for a short time assembled in Mikis Fjord. The *Kivioq* continued the cruise northwards on August 19 in calm weather along a coast so free of ice that one could sail quite close to the famous but ill-reputed Blosseville Coast. The French expedition's barque *Pourquoi pas?* was passed on the evening of the 20th, and soon after they met their first bear. The animal did its best to slip away in the dark, but after a night's exciting chase they managed to get the necessary scenes filmed.

On the entire voyage very little ice was met with. Cape after cape was passed—there is something disquieting in the monotony of this coast—and in the night of August 21/22 the *Kivioq* sailed into Scoresby Sound in most beautiful weather and steered for the colony. In the fjord itself there was much ice and the colony was inaccessible; so they searched in Hurry Inlet for a landing-place clear enough of ice for the seaplane. But an accident with the wireless caused communication with the mother-ship to be broken and the chance to complete the air-photography of the northern part of the coast was thus lost.

After some excursions inland the return voyage was begun on August 25. Amdrup's depot at Cape Dalton was inspected on the 26th and found to be in order: here also both geologist and ornithologist did some useful work ashore. Mikis Fjord was reached on the 28th after spending a day in d'Aunay Bay waiting for better weather. The *Kivioq's* company were now richer for the experience of having traversed the coast in the centenary year of Lieut. Jules de Blosseville's expedition—the same year in which at least the southern part was to be fixed and set down as a map from the photographs of the Seventh Thule Expedition and the points of Captain Einar Mikkelsen.

It was unfortunately no more possible on the voyage southwards than it had been on the northward voyage to visit the house known from Amdrup's report as the House of the Dead which lies near Nualik.[1] But the baggage of Watkins' Expedition was fetched from the house in Lake Fjord and on September 3 Angmagssalik was reached after a voyage in every way satisfactory. The next day saw Knud Rasmussen again at work with the film.

Folklore

For Knud Rasmussen this was the child of his heart. None had the power he had to bring an Eskimo to speak, be it in Bering Strait or Angmagssalik Fjord. He understood all dialects and himself was always understood and

[1] Cf. *Medd. om Grønland*, vol. xxvii, p. 94.

trusted. It was therefore no wonder that they flocked to him with their joys and sorrows. Not only did he help those who came to him but he also used these many conversations to lead him to the source of those beliefs and traditions he sought after. Surrounded as he was with the film work, journeys, disturbances, and difficulties, it was hardly possible for Knud Rasmussen to find time for his own subject. Not only the disquiet without, but also that within, must vanish before it is possible to unlock the memories of these people. Nevertheless Knud Rasmussen had not given up hope of solving the difficulty, thanks to Karale Andreasen.

In Karale had Knud Rasmussen not only an invaluable help with the film work but also something which might be called a living history book of the Angmagssalik Eskimos. Moreover Karale was an artist who understood how to set pen to paper, whether it was to draw or to write. Knud Rasmussen took this man home with him to Denmark so that in the peace of the country house in North Zealand they could together write down what they knew of East Greenland and the East Greenlanders.

The preparations were well advanced. An impression of the entire coast-line from Cape Farewell to Scoresby Sound had been won during the journeys of three years; in each of these three years film and photographs innumerable had been made; further the artist Ernst Hansen, who illustrated Knud Rasmussen's book 'Festens Gave,' had been charged with the task of giving the artist's point of view in his own modern idiom of line and colour, a task which he carried out brilliantly. But it was fated that things should go quite otherwise than foreseen. Neither Knud Rasmussen nor Karale are with us any more. Karale died in Copenhagen on 26 February 1934, just as he had completed his part in the synchronization of the film; not the least tragic aspect of his death was the fact that by no means all that he knew had yet been written down. We do not know at the moment how much of his material has been left; but it is unfortunately certain enough that what remains is a long way short of what had been hoped for.

The account of the events of 1933 may be concluded by describing two incidents of which Knud Rasmussen always spoke with particular pleasure. The first of these took place on the voyage out and was the meeting in Reykjavik with General Balbo, who had just landed here with his great squadron of aeroplanes after completing a stage of the flight from Rome to Chicago. The two expeditions crossed one another; it was a happy occasion for Knud Rasmussen as "Protector" of the armada for Greenland to be able to greet his friend the General in these latitudes. The second incident was again a meeting, this time with the famous aviators Colonel and Mrs. Lindbergh, who visited the Expedition headquarters once or twice in the early part of August during their tour round the North Atlantic Ocean. We all of us had some pleasant days with these charming people; while the brave little aeroplane and the flights they made with it in Greenland could only inspire our sincerest admiration.

Conclusion

"Whoever travels in the Arctic under all sorts of conditions, submitting his body to everything—fatigue, damp, cold, hunger—never knows on

which day his constitution will suddenly say stop."—Knud Rasmussen's *Journal* (unpublished), Igdlukasik, 17/9/1904.

It is strange to sit down with Knud Rasmussen's East Coast diaries before one, right from the first, written in August–September 1904, to the last, from the summer of 1933. These diaries contain certainly a great amount of incident. But how much has happened during the many intervening years when he made his famous sledge journeys through the most desolate regions of the world, from Independence Fjord to Bering Strait! How much striving and determination, how much of the joy only explorers know! And now one may ask oneself what had been the driving force behind these proud achievements.

The answer to this can be found in his own first book of 1905, 'Nye Mennesker' (New People), wherein he describes how as a boy in his birthplace, Jakobshavn, in North-West Greenland, he could never tire of hearing his elders' tales of the wild race that lived in the North at the end of the world, where they went clad in the skins of bears and ate raw meat. The wish was fired in him to travel to that far country; his first decision as a grown man was to go on a journey to visit this new people. The impression made on him when he actually met the polar Eskimos was so great that it decided the trend of his life, which afterwards was to be a perpetual journeying to new peoples.

It was not only the Eskimos of to-day that he sought. Other questions came crowding in which were indeed worth pursuing: questions as to the past history of this or that race, its origins and its migrations. All of these were questions of such wide significance that he proposed that all nations with coasts along the Polar seas should co-operate in their solution.

Knud Rasmussen himself went ahead and showed the way. He was happy to remember that he had been born at a time when the dog-sledge was still the only effective means of transport; not for nothing did he earn the reputation of being the world's best sledge-driver.

But Knud Rasmussen's heart did not belong to Greenland alone. He was also a dutiful son to his fatherland Denmark and wished to see a whole and united Greenland under the Danish flag; in political matters he showed a foresight which is astonishing. When American interests were naturally directed through Peary towards the Cape York region, he saw it before any one else and by erecting in 1910 his Thule Station he saved the whole of this territory for Denmark. When later the conflict over Denmark's great colony broke out in earnest, he was immediately to the forefront; he indeed welcomed the opportunity of extending to the East Coast the work he had done on behalf of the Greenlanders. Knud Rasmussen here allowed folklore research to take a second place to his survey work for the first time, and since surveying was the principal object of the expedition, he exerted himself greatly. But this should not be taken as meaning a break with his former interests; rather it must be seen from his point of view as a good Danish citizen, who felt that the time had come to prepare a satisfactory map, not only of the better-populated West Coast but also of the more desolate stretches of the East Coast. This map should not only concern itself with the outer coast: it should extend right over the unknown territory as far as the boundary of the inland-ice. From the technical point of view the problem of creating such a map was solved. Such an ambitious programme of mapping would knit Denmark to Greenland better

than anything else; further, it would make a connection from one settlement to another and would also help to break down the barrier between East and West Greenland, which had been almost different continents since the disappearance of the old connection about Cape Farewell,

For Knud Rasmussen these expeditions with elaborate survey plans were only a means to an end. It was not his intention to do more than show the way; others would complete the work. He had planned to withdraw in 1933 so that for the foreseen completion of the work in 1934 he would not have been leader but "Protector." Such an attitude is easy to understand. These large expeditions demand of the leader all that he has. Day and night he is as chained to the wireless and it is hardly credible how Knud Rasmussen in spite of it all managed to take as much part as he took in the various endeavours. But it was at the cost of his strength. The modern technique, the relentless *tempo*, the continual change of plans conditioned by radio: all these tired him with their merciless monotony, and he sought rest by returning to the old researches into myths and sagas, when he would have none other than Greenlanders about him. He was their uncrowned king. It was an experience to see him amongst them.

The East Coast researches were directed especially to the district between Angmagssalik and Cape Farewell. This stretch is now quite deserted, but once, as testified by the many house-ruins, it supported a rich life. Was it possible to bring the lost life back to this coast? The question is not yet answered, but the diaries show how often Knud Rasmussen returned to this question; they are crowded with notes on hunting and living conditions.

The Seventh Thule Expedition was Knud Rasmussen's last journey. Through all these years he had submitted himself to the most incredible discomforts. But the above quotation from his own diary shows that he had never deceived himself and that he knew that a crisis might come at any time. But it was not only the fatigues of the open that wore him out: the work indoors during the collection of the sagas had also its dark side. Thus he writes the following in his diary for 1904:

"This evening I was tired out, when a message came that Susanne wanted me to sup with her.

"I was tired enough, but went out of a sense of duty, since there were various things I wished to ask about and it seemed to me that I should take an opportunity when it came. She gave me boiled cod—it had been kept till it was rotten—with old blubber-drippings as sauce. Rotten meat I can eat, but I have never been able to accustom myself to rotten fish. To cut a long story short, the meal was revolting.

"It was so indescribably filthy in the house, that, when I sat and ate the rotten fish which was laid on the unappetizing floor where there stood the filled urine buckets and when at the same time I had to hold a lively conversation with my hostess, it seemed to me that results could be dearly bought —but a satisfactory saga collection cannot be made by a prude."—Igdlukasik, 16/9/1904.

Knud Rasmussen threw himself in this way into everything he undertook. No difficulties were so great that they could not be overcome; nothing was so

dearly priced that it was not worth its cost. But one day the spell broke: one day the whimsical prophecy was fulfilled: his constitution suddenly said "Stop." He died on December 22, an infinitely miserable grey winter morning.

It has been an unforgettable experience to be one of his closer colleagues on these expeditions. Knud Rasmussen had a rare combination of brain and heart: indeed this it was that lifted him above the general mass. Though he was so completely a unity, so absolutely hewn from a single block, he had so many facets that it is difficult to pick out from the others that quality which was the most distinctive. His wonderful skill as an arctic traveller has already found its expression in the phrase—"the world's best sledge-driver." As Eskimo ethnologist he presented his rich and unique collections to his country. As artist and poet he has allowed us all, through his books, to share the beauty of the great spaces of the North. To the Greenlanders he was so bound by the trace of Eskimo blood that ran in his veins that those in Greenland felt him to be one of themselves; it is no wonder that he should have become their ambassador to the whole world. And yet out in the world he was not only the ambassador of the land of his birth, Greenland, but also that of his fatherland, Denmark.

Nevertheless, even if it is hardly credible that any man should have more or greater qualities than these, perhaps it was just as a man that he was greatest. In him were assembled the noblest qualities: honesty in thought, love of truth, loyalty, and modesty: all were there. His prowess gave him a world fame; he became his country's hero, and in many a hut from Greenland to the Pacific will the generation that lives and the generations that come sing new songs to the deeds of Kununguaq.

DISCUSSION

Before the paper the PRESIDENT (Major-General Sir PERCY COX) said: All Fellows of this Society know very well, and hold in great respect, the name of Knud Rasmussen, the great Greenlander, a great national hero who was awarded the Gold Medal of this Society eleven years ago and had read papers on our platform, and who died, all too soon, in December 1933. At the time of his death he had not written up the narrative of his last two expeditions, the Sixth and Seventh Thule Expeditions, as they are called, because they were mainly made possible and financed by the Settlement which Rasmussen had established at Thule on the West Coast of Greenland.

Captain Gabel-Jørgensen, who is to read the paper to-night, was Rasmussen's Second-in-Command and surveyor on the Sixth and Seventh Thule Expeditions. Captain Gabel-Jørgensen is a soldier by profession who has especially taken up surveying. He has spent several years on the West Coast and other parts of Greenland engaged in surveying and did valuable work with Knud Rasmussen on these two journeys. He is going to tell us about them to-night. It is very courageous of him to come here and speak to us in our own language. I am sure you will appreciate the effort he is making. He will first give us some thirty slides, and then a twenty-minutes' film and, finally, a slide or two of Rasmussen.

I am glad to tell you that we welcome here to-night H.E. Count Ahlefeldt-Laurvig, the Danish Minister, and his lady. It is a great pleasure to us to see them here again, and I hope the Minister will address us a few words after

Captain Gabel-Jørgensen's lecture. I now ask Captain Jørgensen to give his lecture.

Captain Jørgensen then read the paper printed above, and a discussion followed.

The PRESIDENT: I will first ask Count Ahlefeldt-Laurvig to address us.

H.E. THE DANISH MINISTER: I feel honoured to be here to-night both as the representative of my country and as an intimate friend of Dr. Knud Rasmussen. I appreciate the honour all the more because it provides me with an opportunity to bring you, Mr. President and the Fellows of the Royal Geographical Society, thanks for having given us an opportunity to listen to Captain Gabel-Jørgensen's interesting and charming lecture in honour of our departed friend, Knud Rasmussen.

Dr. Knud Rasmussen was not only a great explorer and scientist but the hero of the whole Danish nation. His life was at the disposal of his country. He faced death bravely hundreds of times. I feel sure that Dr. Rasmussen would have preferred to die on the battlefield like the Vikings of yore, but that privilege was not to be his. God however willed him to die in the prime of his life and at the summit of his fame.

Once more I must thank you, Sir Percy, for having shown Knud Rasmussen this last honour. Denmark is fortunately a virile nation. Dr. Knud Rasmussen always used to say that he considered the Royal Geographical Society his second home, and I hope that you, Sir Percy, will also let the Royal Geographical Society become the home of those who are to follow in Knud Rasmussen's footsteps.

The PRESIDENT: I will ask Mr. Spender to come up on to the platform for a few moments. Mr. Spender is an Englishman who has been in Denmark a number of years studying at the Geodetic Institute. He too was with Knud Rasmussen and Captain Gabel-Jørgensen on his last expedition.

Mr. MICHAEL SPENDER: I have been exceedingly fortunate in having had the privilege and experience of working with the Danish surveys in Greenland. Not only has the work itself been interesting, but it has given me the opportunity of meeting many people, of whom Admiral Andrup, Captain Einar Mikkelsen, and the lecturer this evening are examples—men who have given great sections of their lives to Greenland. You can understand therefore with what anticipation I had looked forward to a summer with Dr. Knud Rasmussen. The greater, then, my disappointment to find that the conditions of a modern expedition disperse its members so much that to meet one's leader becomes a rare and seldom event. But once or twice in the summer of 1933 it was our privilege to entertain, or to meet, Dr. Knud Rasmussen. On such an occasion one would learn with surprise that although he had been seemingly occupied to the very limit with the film or with the administration of other people's affairs, he was completely informed of the details of one's own work and had a very shrewd idea of the personal relations in the expedition itself. In conversation with one he would speak directly and personally to each of us. He would never forget one's own idiosyncrasies and always made one feel that the conversation he was having with one was quite special. If one thing was more characteristic of Knud Rasmussen than anything else it was his capacity to perceive the best in every one with whom he came into contact. It was this perception of the best which gave him that best, and not only gave him that best but implanted a deep-rooted loyalty which exists, I think, in all those who have worked under his leadership.

Having seen so little of Knud Rasmussen during the expedition, we had looked forward to seeing more of him during the working up the results. These

hopes, too, were soon cut short by his all-too-soon death in December 1933. But, at any rate as far as I was concerned, the Greenland work continued and, little by little, as one became better acquainted with the history of developments in Greenland, one learnt of the part Knud Rasmussen had played in furthering the ideal of Greenland for the Greenlanders.

In this hall I have often heard praise of the way the Danes look after the Greenlanders, and I am sure those who have known the administration at first hand will hope that the policy which so ably expresses Knud Rasmussen's ideal will be strong enough to resist attack. One can easily enough understand a people harassed by unemployment and perplexed at the present trend of international affairs considering the opening of Greenland to European exploitation. But it is hard to believe that such a break with the traditional policy would not reduce the status of the Eskimos who, trained and educated by the Danes, are tending to take more and more responsibility in their own affairs. Their present Utopia, one feels, the land without policemen and without prisons, would vanish at the advent of the white man.

South-East Greenland, at any rate, is unsuitable for European settlers, but it could possibly support a recolonization by an Eskimo people still skilled in hunting practices. For us, it is the great hope that our maps and the information we have collected will be able to be used as the basis for such a recolonization. I hope, indeed, that the time will come when perhaps the new Inspector of Greenland, Captain Einar Mikkelsen, will be able to come here and tell us of new settlements and of new life on those coasts.

For me, the lecture coincides with the end of two years' close cooperation with the lecturer, Captain Gabel-Jørgensen. It is the lot of Army officers from time to time to have to abandon their specialists duties and return to barrack life. It will no doubt be with mixed feelings that such an enthusiastic surveyor leaves the Geodetic Institute in a fortnight's time. But I can be glad that it was my fortune to serve under so zealous an officer.

From 1927 to 1931, for four years, Captain Gabel-Jørgensen triangulated in West Greenland. One of the young topographers, speaking to me once, paid him perhaps the best compliment which can be paid to any surveyor. He had been plane-tabling amongst Captain Gabel-Jørgensen's triangulation points. Speaking of the first order points, he said although they had been laid out some 20 miles apart they had been so well placed and were so distinct that he could carry out the whole of his plane-tabling using them alone, without reference to the points of the lesser triangulations. Those of you who may at some time sail up the West Coast of Greenland round about the latitude of Disko, or perhaps north of it, may perhaps see some of those enormous cairns, part of the Geodetic Institute's Survey of Greenland, and you may remember that it was this evening's lecturer who built them.

The PRESIDENT: Mr. Augustine Courtauld, will you come and speak to us? Mr. Courtauld saw a good deal of Knud Rasmussen on one of his expeditions, and I know you will be glad to hear him on the subject.

Mr. A. COURTAULD: It is some time ago that I was privileged to meet Dr. Knud Rasmussen and, if you will forgive me reminiscencing, it was a time to which I looked forward for very many months, and which I shall never forget. Knud Rasmussen, or Knusi, as they call him, was always a name to us when we were in Greenland; he was, in some ways, rather a myth. Whenever we met Greenlanders or Eskimos we always heard of him, but in such a strange way that one rather got the idea that he was a sort of spirit rather than an actual man. When we heard that there was just a possibility of our meeting him on our coast journey, I do not quite know who it was we really thought we were

going to see. But actually on that journey we were unlucky enough not to meet Knud Rasmussen. However by pushing on as quickly as possible to our destination we met him, he having got in the day before we did.

I think we expected from his enormously long record of travel and the numerous stories we had heard about him that we should see a very old man, rather austere, who would frown very much on us three for causing a lot of trouble. He had been looking for us. We had not a wireless and there had been doubt as to where we were. We thought we should get rather a wigging from an old hand at the game and be sent off home by the next boat. It was with some difficulty that we recognized his boyish figure. He seemed younger than we were, and as I am the only man of the three left now who can speak of that time, it is of great interest to me to recall him coming down to the shore to see us; far the youngest man he seemed there. He was so very pleased to see us, that it really absolutely put us on our legs to find him in that frame of mind. But no sooner had he introduced us to some friends in the big settlement at Nanortalik than he disappeared. When we turned round and asked where he had gone we found he had just left: nobody knew where, and he was not to be seen again for another fortnight. Apparently it was never Rasmussen's habit to spend a single moment more than he could possibly help in a large settlement. He would always be away out among the outer places, sleeping, eating, and entirely living with the Eskimos so that he could listen to their talk all the time and collect more stories and more information from them.

To my mind, and I know Gino Watkins thought exactly the same as I do—we very often spoke of him—Knud Rasmussen was the greatest Arctic explorer of this generation, and possibly the greatest there has been, because, as you have heard already, he combined everything. He was not simply concerned with measuring things. He was not simply concerned with piling up scientific facts for scientists. Neither was he concerned only with making long journeys or in acquiring a great reputation for himself. I think he was the ideal explorer and traveller, and I do not think any one could take a better model than his life or could read better books about the North than those that Rasmussen has written.

The PRESIDENT: Our Honorary Secretary, Mr. Wordie, has done a great deal of travel in those regions in Greenland. Mr. Wordie, will you address us?

Mr. WORDIE: Captain Gabel-Jørgensen has paid a great tribute to Dr. Knud Rasmussen, and we can hardly add to it. Rasmussen was a great explorer and a great poet; and the combination of these two qualities made him the best-known and the best-loved man in Greenland. Captain Jørgensen however has, I feel, subordinated both himself and his own work while praising his leader. He has also not forgotten the other pioneers, Gustav Holm and Admiral Andrup, who made that wonderful boat journey down the coast. The lecturer has in fact kept himself almost too much in the background. I am sure nevertheless that those who appreciate good mapping and good exploration must all have felt that Captain Jørgensen himself played a much greater part in making the expedition a success than he would have us believe. His maps are admirable and far in advance of anything previously accomplished in the unexplored Arctic. We thank him to-night, not only for telling us about Dr. Knud Rasmussen, but equally for giving us such a fine picture and description of South-East Greenland.

The PRESIDENT: We have had a very fine and most eloquent lecture. It is a wonderful performance on the part of Captain Jørgensen that he should have been able to give in English and in a voice that could be heard everywhere such a fine account of the splendid character whose early passing we so much deplore.

I cannot compete in language with his eloquent tribute, and I will not try, and will only say that we have been honoured to have such a lecture this evening. I am sure those of us who have heard it will never forget the description of the fine character and the extraordinary combination of qualities of which we have heard to-night. Rasmussen seemed to be everything that one could admire: poet, hunter, artist. Every admirable quality which man can inherit or possess seemed to be concentrated in him. Denmark, we know, is greatly proud of his memory as she was proud of him during his life. We as a Geographical Society which helps men to go exploring in all directions, as far as possible have much association with exploration in Greenland, and I may tell you that one of the most pleasing things that I have come to realize since I became President of your Society is the extraordinarily frank and happy relations which exist between the Danish explorers and our own men who go to Greenland and the north polar regions. We treat each other with complete confidence, we telling them our plans and they telling us theirs, and advising us as to whether they think our plans are good or bad. It is really an extraordinarily happy example of international relations in the field of geography.

I thank the Danish Minister very much for honouring us with his presence to-night and for the kind tribute he paid.

Finally, I beg you to join me enthusiastically in thanking Captain Gabel-Jørgensen for his very fine lecture.

RECENT OBSERVATIONS ON THE LOESS OF NORTH CHINA

GEORGE B. BARBOUR

SINCE the days of von Richthofen the problems connected with the characteristic feature of the North China highlands have been keenly debated. The loess has been regarded in turn as an aeolian deposit, as a river-basin accumulation, as a lake silt, as a product of weathering, and as a complex of mixed origin involving the local redistribution by wind of material supplied by one of the other agencies—glacial and volcanic forces have never been seriously considered as far as this region is concerned. Recent detailed work along a variety of lines has thrown fresh light on the problem. A combined attack by the stratigrapher, the physiographer, the soil expert, the chemist, and the mineralogist is having its effect. Even the archaeologist has his word, for palaeolithic *foyers* occur at the base of the Upper Pleistocene loess, while more ancient deposits have yielded the implements associated with *Sinanthropus* (Peking Man).

Hitherto observers have not been in agreement as to what should be included in the term "loess." Hence a confusion has arisen like that surrounding the use of the word "laterite" in the tropics. The true loess is a yellow-gray, non-stratified, coherent, fine-grained loam deposit which shows the vertical cleavage characteristic of the loess-lands (Plate 1). The definition is thus in the first place a structural and textural one, predicating nothing as to its mode of origin or its composition. In point of fact however, as will appear below, a general correlation exists between all three aspects.

Three types of surface deposit

I. Loess of the type described accumulated in North China during the Malan (Upper Pleistocene) stage of aggradation. It is without bedding (see Plate 3) except in marginal areas where occasional layers of talus were washed down by thunderstorms, and along the axes of depressions in which, even during those more arid days, standing or flowing water was still present, at least intermittently.

Apart from shells of land-snails, occasional ostrich-egg fragments (*Struthiolithus*),[1] and still rarer hackberry seeds (*Celtis*),[2] the fine-grained facies is almost devoid of fossils. The characteristic Upper Pleistocene mammals are virtually restricted to the sandy lenses which mark the position of former water-holes and stream channels. The palaeolithic *foyers* found by Teilhard and Licent[3] near the base of the formation on the margin of the Ordos are similarly situated.

Reasons have been put forward elsewhere[4] for the belief that von Richthofen[5]

[1] J. G. Andersson, "Essays in the Cenozoic," *Geol. Surv. China, Mem. A.* 3, 1923, p. 53.

[2] G. B. Barbour, "Kalgan Area," *Geol. Surv. China, Mem. A.* 6, 1929, p. 68.

[3] P. Teilhard and E. Licent, "Discovery of a Palaeolithic Industry in N. W. China," *Bull. Geol. Soc. China*, vol. 3, 1924, p. 45.

[4] G. B. Barbour, *Geol. Mag.*, vol. 67, 1930, p. 467.

[5] F. von Richthofen, 'China,' vol. 1, Berlin 1877, p. 74.

1. Loess canyon, Great West Road near Tayu, Shensi

2. A village of cave-dwellings in a loess cliff near Tingkow

3. A natural bridge in the loess near Anting, Kansu

4. Loess veneer with dark basal contact, resting unconformably on banded loessic loams

5. Fluvio–Lacustrine beds at the base of banded loams

6. The summit of the loess plateau of the Shensi Kansu border, looking north

was correct in regarding the bulk of the Malan loess as an aeolian deposit. The most convincing arguments lie (1) in its regional spread and variation as related both to the likely sources of detrital supply and to the trend of atmospheric pressure gradients, and (2) in its local topographic distribution, especially where it occurs far up the slopes of flanking mountains or overlooking the Huangho delta plain. Corroborative evidence is found in the character and distribution of the fossils; and in the thinning out and change of facies in the loess when traced down wind into the maritime belt and towards Manchuria, or up wind onto the Mongolian plateau where there is insufficient topographic relief to harbour, or vegetable cover to anchor, the finer wind-swept material. Aeolian activity of this kind has been described from Montana,[1] Patagonia,[2] the Sudan,[3] and elsewhere, and may still be seen operating on a feebler scale in North China to-day. The imported sediment which fell at Peking during one night of a heavy dustfall in March 1927 was estimated at 110 tons per square mile. Microscopic analysis showed it to be indistinguishable from typical loess of the Malan type.[4]

Failure to differentiate the formation from more ancient underlying ones has been responsible for exaggerated ideas as to its thickness. Travellers' references to "thousands of feet" of loess are also explained by the fact that a thin loess cover, veneering a dissected surface of 1000 feet relief, was assumed to imply a vertical thickness of that order of magnitude. In point of fact, there is no record of more than 600 feet thickness of undoubted loess, and throughout most of the region it does not exceed 100 feet (see Plate 2).

II. Over much of the North China highlands the Malan loess rests on an older deposit which shares some of its characteristics but has certain distinctive features. The colour is usually redder, the texture is slightly more clayey, and the vertical cleavage less perfect than is the case with the Malan loess (see Plate 8). Moreover the cliffs show a crude layer structure, marked by faint colour-banding and zones of concretions, the individual layers being from 2 to 30 or more feet in thickness (see Plate 7). The material in the centre of the thicker layers is less red in colour, loessic in character, and in the hand-specimen cannot be distinguished from the pure Malan loess. As many as twenty such layers can be counted in Plate 4. This approach to stratification frequently has a distinct dip conforming to the moulding of the depressions in which the material lies. In the centre of the basins the deposit often grades into stratified sandy beds or laminated lake silts (see Plate 5) with fresh-water mollusca, plant fragments, and occasionally gypsum.

There can be no doubt that the dark bands represent a succession of ancient "fossil" soil horizons from which the more soluble material was leached, the lime being redeposited in the concretionary layers which occur just below. Deposition must have been interrupted by long pauses during which the surface was exposed to weathering for sufficient time to develop mature soil profiles before being buried under a fresh accumulation. The origin of the

[1] N. S. Shaler, "Loess Deposits of Montana," *Bull. Geol. Soc. Am.*, vol. 10, 1899, p. 246.

[2] B. Willis, 'Northern Patagonia,' Scribners, 1914, p. 106.

[3] Mr. G. W. Grabham, personal communication.

[4] G. B. Barbour and C. J. Wu, *China Jour.*, vol. 7, 1927, p. 305.

material will be considered below when comparing its mechanical and chemical composition with those of the Malan loess. But we may anticipate the conclusions by stating here that the banded loams are believed to be a series of loessic deposits which lost some of their original characteristics as the result of prolonged weathering.

The fluctuating nature of the climatic conditions responsible for the intermittent deposition awaits further investigation, but the process of accumulation undoubtedly covered a much longer span of time than that involved in the Malan stage. From a study of the mammal fossils Teilhard and Young have proved[1] the presence of two main faunal horizons—the Nihowan and Choukoutien associations, of Upper Pliocene and Lower Pleistocene age respectively. To the latter belongs *Sinanthropus*. At least one additional subhorizon is distinguishable (Stage *X* in Fig. C below).

Until this finer discrimination on a fossil basis was made, the entire series of banded loams was grouped with the Sanmen formation, but the palaeontologists have recently been inclined to restrict this useful inclusive term by making it equivalent to the Nihowan.

Over wide areas the loessic loams build physiographic features of major importance, occurring as dissected remnants of a prominent system of matched terraces flanking many of the rivers. But since they are usually unfossiliferous one cannot be sure to which substage they belong. However as the first aggradation was unquestionably of regional importance, it is safe to assume that Nihowan deposits are usually at the base of the terrace features. Physiographically therefore we may meanwhile continue for convenience to refer to the group collectively as Sanmen loams except where a slightly younger age can be demonstrated. Thus far this has only been possible in two or three isolated localities including the cave deposits made famous by the discovery of *Sinanthropus*.[2]

The question arises as to whether these deposits should be referred to as loess. Among engineers and in popular parlance they have gone by this name for so long that a situation has developed analogous to that regarding the use of the term laterite. If the word loess is to be allowed to include these loessic loams then care must be taken to distinguish the Malan loess from these older, partially altered Sanmen loess deposits. The alternative is to designate the latter as "banded loessic loams" or simply "loessic loams," adding a stratigraphic horizon where this is identified.

III. Still older than the loessic loams are a series of Red Clays first studied by Andersson[3] and referred to the Paote Stage (Pontian) of the early Pliocene. They are associated with a less rugged topography than that of to-day and have only escaped erosion on upland surfaces or in protected positions under the loams.

[1] P. Teilhard and C. C. Young, "Preliminary Report on the Choukoutien Fossiliferous Deposits," *Bull. Geol. Soc. China*, vol. 8, 1930, pp. 173–202.

[2] For a discussion of the stratigraphic problems raised by recent palaeontological studies reference should be made to Teilhard and Pei, "New Discoveries at Choukoutien," *Bull. Geol. Soc. China*, vol. 13, 1934, pp. 385 ff.

[3] J. G. Andersson, "Essays in the Cenozoic," *Geol. Surv. China, Mem. A.* 3, 1923, p. 107.

The associated land-forms

Each of the three types of deposit—loess, banded loams, and red clay—shows considerable range of facies, passing laterally into sandier lenses which mark the lines of old depressions. Each is associated with a characteristic topographic surface and exhibits equally typical behaviour when eroded. At times these features of themselves serve to identify a given exposure. Thus the recent alluvium follows the present-day channels; the Malan loess is cut by the gullies and canyons of the last cycle and extends as a blanket over all older deposits well up onto the higher mountain slopes; the Sanmen loams form massive loess-capped terrace remnants and platforms fringing the great structural depressions: and the Paoteh clays, as noted above, rest on a surface of late mature relief and are found to-day most extensively developed on upland surfaces in parts of Shansi and Shensi where the old topography suffered a minimum of destruction during the Pliocene and Pleistocene erosion cycles. The Sanmen and Paoteh deposits are thus the major elements in the thick cap of unconsolidated material which floors the loess highlands (see Plates 6 and 13).

The columnar cleavage of the Malan loess is readily distinguishable from the less regular erosion slopes developed on the Paoteh clays. The Sanmen loams show an intermediate behaviour—vertical loessic faces broken by zones of rougher surface where bands of concretions interrupt the structure (see Plate 8).

In the field these distinctions are often not so evident, for several reasons. All the deposits show overlapping ranges of variation, so that less typical exposures cannot be separated on purely lithological grounds. Moreover wind action at the time of deposition often incorporated local with imported material, obliterating all trace of contact. Hence over wide areas the Malan loess grades down insensibly into the banded loams without its being possible to demarcate the formations (see Plate 13). The ubiquitous loess cover is often inseparable from the older foundation on which it rests.

Finally it must be frankly admitted that though a division into these main formational units explains the major features observed, the periods of accumulation may well have involved fluctuating conditions that gave rise to complexities not yet recognized.

The approximate areal distribution of the various Pliocene and Pleistocene deposits is shown in maps prepared by Teilhard and Young for the memoir on "Fossil Man in China," [1] made under the direction of the late Dr. Davidson Black.

The latest of the loess epochs, that of the Malan Stage, was the final one to leave its mark on the topography of the region. Where the older formations had been spared, especially in the western provinces where they were most thickly developed, the Malan loess is only the last veneer (Plate 14). Where the immediately preceding erosion cycle scoured down to bedrock, it alone surfaces the country side (Plate 16).

Erosional Features

The peculiar erosional features of the loess highlands are largely explained by the vertical cleavage and the fine grain of the material. When a cliff or

[1] *Geol. Surv. China, Mem. A.*, 11, 1933.

gulley wall is undermined by running water and collapses, the debris need await no further break-up by weathering, but can go into suspension at once, the water becoming loaded with silt to the consistency of a thick cream and leaving little or no coarse residue except for occasional concretions or pebbles from localized gravel pockets.

Back from the gully edges, the porous character of the soil induces rapid movement of water through the ground in quantities which in more argrillaceous deposits would cause extensive channelling by run-off. When this underground seepage concentrates into a flow with a definite outlet, it may erode vigorously by a process of sapping and chimneying. The cavities so produced extend headwards and upwards till they strike the surface, the ground then caving in as a sink-hole. Subsidences of this kind are apt to occur on the sites of long-forgotten graves, where the earth filling is less compact and cemented than the surrounding loess, thus causing a slight initial concentration of subsoil water which eventually undermines the spot. The development of natural tunnels and arches (see Plate 3) is only a more advanced stage of the same process. These and other loess terrain features have been described and illustrated often enough[1] to require no further mention here.

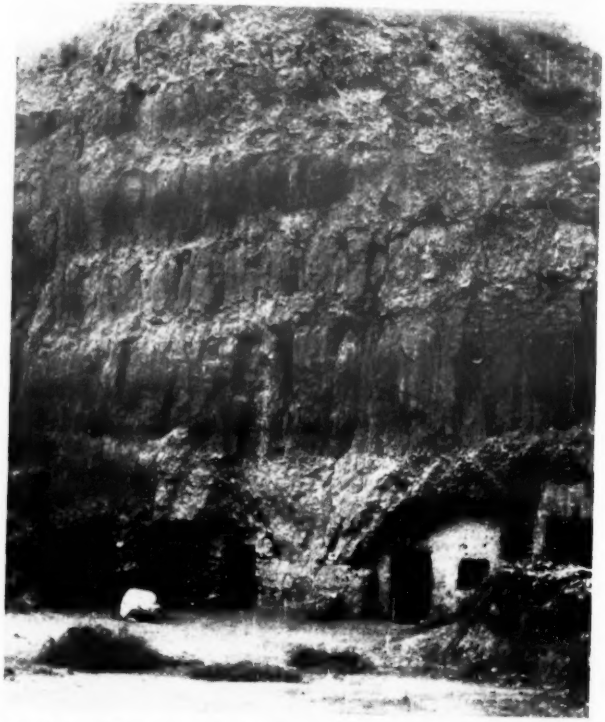
A series of air-views of loess terrain along the Shansi-Hopeh border illustrates the topographic pattern developed during the erosive destruction of the smoothly contoured loess surfaces. Where the Malan aggradation built up a surface of uniform slope with no undulations to concentrate the drainage, the gullies tend to be straight, parallel, and fairly evenly spaced, as in Plate 10. The perfection of the pattern in this case has been marred by the vigorous efforts of farmers, each of whom seeks to thwart the headward extension of the gullies by terracing his field so as to divert the threatening calamity elsewhere. A striking example of this parallelism is seen in the photograph (Plate 9) taken in eastern Shansi.

Where the slope is inadequate to exercise such unidirectional control, the gully heads are less regular and their extension is apt to be determined by minor features which are soon lost in the general destruction. The old road in the left centre and foreground of Plate 9 evidently acted as a convenient channel for surface run-off and thus offered an easy line of advance for the gully head, which will continue to encroach and devour further stretches of the thoroughfare. Elsewhere the chance location of a terrace-wall, a goat-track, or even a shrub, stone, or grave mound may be the determining factor. On the photograph, taken from a height of 1000 feet, the right foreground shows how the canyon floor has already been brought under cultivation, with a carefully diked channel along its further margin to confine the run-off and prevent further ravages. The irregular slopes of the canyon walls show that the Malan loess here forms only a thin coating over loam of Sanmen type. The correctness of the inference was proved by a visit to the locality, which lies on the eastern edge of the Showyang basin, 5 miles from the branch railway line to Taiyüan, the Shansi capital. The maximum thickness of loess here seldom exceeds 20 feet and over most of the area it is less.

A more advanced stage of dissection is seen in Plate 10, where 50 per cent.

[1] *E.g.* M. Fuller and F. Clapp, *Geog. Rev.*, vol. 14, 1924, p. 25.

7. Concretionary layers and dark zones in banded loessic loams, Shansi



8. A dwelling excavated in the base of impure banded loam, Shensi

9. Headward encroachment of irregular gullies on the margin of a cultivated loess plateau, Shansi

10. Intricate erosion fretwork in loess-capped loams, Shansi

of the surface has become canyon bottom-land and the original surface is left only as intricately fretted platforms every precious inch of which is kept under

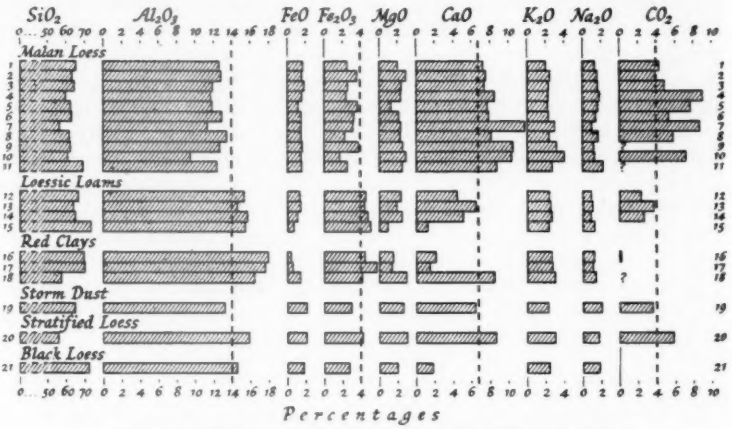


Fig. A. Chemical Analyses of Loess and allied deposits

Malan Loess

1. Loess, Taiku, Shansi. (Barbour H. 11), Anal. Herdsman.
2. Loess, Shanchow, Honan. (Barbour H. 13), Anal. Herdsman.
3. Loess, Pinchow, Shensi. (Barbour H. 14), Anal. Herdsman.
4. Loess, Weining, Kansu. (Lee), Anal. Geol. Surv. China Lab.
5. Loess, Taiyüan, Shansi. (Lee), Anal. Geol. Surv. China Lab.
6. Loess, Yungchu, Shansi. (Moyer 9239), Anal. Byers.
7. Loess, Showyang, Shansi. (Moyer 9251), Anal. Byers.
8. Loess, Linhsien, Shansi. (Moyer 9245), Anal. Byers.
9. Loess, Chinghsing, Hopeh. (Lee), Anal. Geol. Surv. China Lab.
10. Loess, Shinkiang, Shansi. (Lee), Anal. Geol. Surv. China Lab.
11. Loess, Mienchih, Honan. (Lee), Anal. Geol. Surv. China Lab.

Loessic Loams

12. "Reddish loam," Taiyüan, Shansi. (Barbour H. 17), Anal. Herdsman.
13. Red banded loam, Pinchow, Shensi. (Barbour H. 18), Anal. Herdsman.
14. Red loam, Yungshow, Shensi. (Barbour H. 10), Anal. Herdsman.
15. Red loam (Siashu), Chinkiang, Kiangsu. (Barbour H. 19), Anal. Herdsman.

Red Clays

16. "Red soil," Tzechowfu, Shensi. (Moyer), Anal. Byers.
17. Red clay, Pehpiao, Jehol. (Barbour H. 20), Anal. Herdsman.
18. "Red clay," Paoteh, Shansi. (Lee X), Anal. Geol. Surv. China Lab.

Storm Dust

19. High altitude dust, Mar. 1927, Peiping, Hopeh. (Barbour H. 15), Anal. Herdsman.

"Stratified Loess"

20. Intercalation in Malan Terrace, Lanchow, Kansu. (Barbour H. 12), Anal. Herdsman.

Black Loess

21. Black loess, Showyang, Shansi. (Barbour H. 12), Anal. Herdsman.

cultivation. The two villages in the right distance have chosen safe sites on valley floors. Careful study of the remnants of the older surface in this view

and in Plate 15 reveal a moulding with subdued depressions which have controlled the anastomosing gully pattern.

In parts of the Shansi mountains subject to the heavier rainfall of the maritime belt, erosion during the Chingshui epoch which followed the early Pleistocene aggradation left only a bare rock foundation with little or no Sanmen substratum (Plate 16). Here all hope of cultivation vanishes once the thin soil cover is stripped. The destruction of the latter is rapidly taking place on account of the relief which the loess was inadequate to blot out. Bifurcating gullies with enlarged cirque-like heads encroach on the few remaining patches of arable land on the divides. Even here the abrupt discontinuity of surface between the gully walls and the artificially terraced loess caps is evident. Plate 17 shows an excellent example of the length to which such terracing is carried in attempts to salvage the last remnants of fertile soil.

The series of air-views is completed by one of the Hwang Ho delta plain south of Paoting, taken from an elevation of 4000 feet to show the strip pattern of cultivation (Plate 15).

The character of the loessic material

In investigating the question of the aeolian origin of the loess of the Malan stage and the older loessic loams, it became important to see how far the material itself in any given deposit is independent of the character of the rocks of the immediate neighbourhood. With this in view, samples were taken in widely separated localities scattered over seven different provinces of North China. Selected specimens were analysed chemically and compared with the few available analyses made by other observers. Similar tests were run on samples of typical banded loessic loams. The loam specimens taken were all of the characteristic reddish variety that forms the bulk of the more massive deposits, the varietal range shown in the banded profiles being left for further study by soil specialists. Though the total number of loams studied thus far is more limited, the analyses show such surprising uniformity that it seems desirable to place them on record at this date.

Chemical analysis

In Fig. A the results are shown in bar-graph form, the first eleven being chemical analyses of loess. Fifty per cent. of silica is neglected in each case, and the balance indicated in units five times smaller than those used for the remaining chemical constituents. The same convention applies to the other samples, of which Nos. 12–15 are of loessic loams, 16–18 are of Paoteh red clay, while 19 is the dust from the storm-fall mentioned above; 20 is a water-laid intercalation in stratified loess from the banks of the Hwong Ho at Lanchow, and 21 is a peculiar local black loess from Shansi, closely resembling the more widespread deposits of the same kind in Manchuria.

When these graphs are compared, the most striking feature is the small range of compositional variation shown by the members of any one group, except in the case of analysis 18 which is taken from an older published source where it is referred to as "red clay," but which may be incorrectly classified. The analysis in question, like those of samples 9 and 11, is incomplete with regard to CO_2, so that the other elements should be reduced proportionately,

11. A photograph from the air showing the parallel gullies in the loess terrain of S.E. Shansi

12. A photograph from the air showing the unusually regular gulley-pattern in the loess terrain of the Shensi–Honan border

13. A canyon in loess-capped banded loams

14. Erosion-gullies in loess-capped loams, Shansi

possibly by as much as 6 per cent. Some of the samples came from a limestone terrain, others were from areas of Palaeozoic sandstones and shales, while others were taken near areas of igneous or metamorphic exposures. In no case is the composition of the country rock evident from the analyses.

Dotted vertical lines have been drawn to indicate the limiting range of four constituents, and show that the alumina content of none of the loesses exceeds 13·5, whereas that of all the loessic loams lie between 14·5 and 16 per cent. Similarly all the loams show an increase in ferric and a decrease in ferrous iron, a fact which might have been anticipated from the redder tint of the material. A like uniformity is seen in other constituents, the lime and carbon dioxide falling off noticeably, and the soda decreasing slightly in comparison with the more stable behaviour of the less soluble potash. The two first red clay samples carry the same tendencies a stage further.

The nature of these slight but distinct differences between the members of the first and second groups is taken to indicate that there is a close genetic relation between the loess and the banded loams. Moreover the changes are all those that would be normally produced as the result of weathering of the first, and would not be liable to occur in the reverse direction. It therefore allows us to decide between two opposed theories as to their respective origins. Either (1) the banded loams were developed largely from local weathered products, the Malan loess then being merely derived from them and redistributed by wind, or (2) both formations are essentially composed of wind-imported material with only a small percentage of fine detritus of local origin, but the banded loams subsequently underwent alterative chemical changes from which the later Malan loess was spared. A study of the analyses leaves little doubt that the latter is the true explanation. Such a hypothesis, of course, does not rule out the possibility of the incorporation of a considerable amount of local decay material washed down at intervals from the weathered rock exposures higher on the slopes, nor of a measure of resorting and mixing by later rainwash action. In fact both these factors undoubtedly played their part. But such incidents do not appear to influence the general uniformity of the product, and the main inference to be drawn is that the aeolian process was the dominant one in the depositions of both formations.

Mechanical analysis

In corroboration of this interpretation, mechanical tests were also made on the same samples as had been used for the chemical studies. These have been similarly graphed, and the histograms resulting are shown in Fig. B. The method adopted for the test was the standard one of settling from suspension in water. After the material had been broken up (using a centrifuge on duplicate samples, and taking care to secure deflocculation where microscopic tests showed this to be necessary), it was shaken up in water in a standard column and the amounts deposited during given time-periods were calculated from the weight of evaporated suspensions drawn off by pipette at stated intervals. Duplicate tests were run, and the size values deduced were checked against a calibration curve previously tested for the standard conditions under which the apparatus was regularly used. The work was kindly carried out for me by Miss E. Salmon in the laboratory for sedimentary research at Columbia University.

In Fig. B the first four histograms are of loess samples of which chemical analyses had been made in connection with the present study. The second column is of loessic loams, while the third has a mixed group, No. 11 being of Paoteh red clay. In all these samples the great bulk of the material is less than 1/16 mm. in diameter and that in the true loess types the fraction lying between 1/16 and 1/32 is very definitely the major element, accounting for more than 40 per cent. in all cases. It may be noted that sample 10 (the black loess from

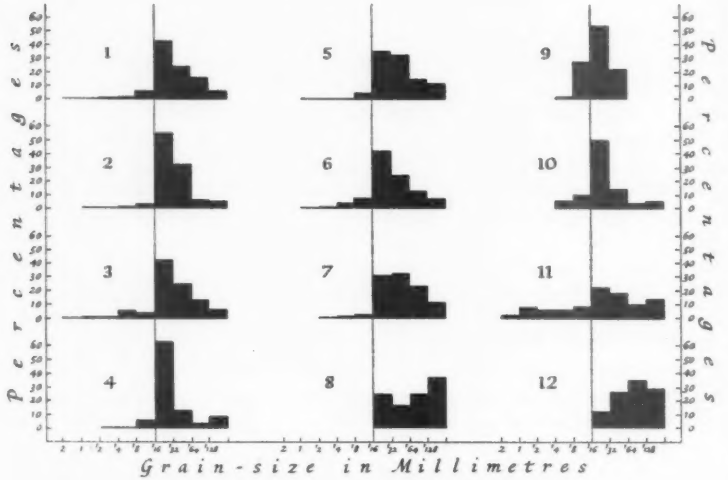


Fig. B. Histograms of Loess and allied deposits

1. Loess (Malan), Kweitzeyu, Hopeh.
2. (8) Loess (Malan), Linhsien, Shansi.
3. (2) Loess (Malan), Shanchow, Honan.
4. (1) Loess (Malan), Taiku, Shansi.
5. Loessic loam (Siashu), Chinkiang, Kiangsu.
6. Loessic loam, Pingliang, Kansu.
7. (13) Loessic loam, Pinchow, Shensi.
8. (12) Loessic loam, Taiyüan, Shansi.
9. Loess, Hopeh (Geol. Survey specimen).
10. (21) Black loess, Showyang, Shansi.
11. (17) Red clay, Pehpiao, Jehol.
12. (20) "Stratified loess," Lanchow, Kansu.

The figures in brackets refer to Fig. A.

Showyang) is texturally akin to normal loess. Sample 9 is an impure loess of which a sample was furnished by the Geological Survey of China from the Hopei marginal region, while sample 12 is the water-laid stratified loess from Lanchow in which a high proportion of mica and clay was detected under the microscope. The chief point of interest in comparing the first two columns of histograms is the way in which the finer clay fractions in the loessic loams has increased at the expense of the fraction of next larger dimensions, thus bearing out the inference from chemical study that the banded loams represent a

15. Shadow and sunlight on the delta-plain of the Hwang Ho

16. Bifurcating gullies encroaching on a divide in loess-capped Palaeozoic terrain

17. Elaborate artificial terracing of loess remnant capping Mesozoic bed-rock

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more advanced state of weathering than the loess deposits of the Malan stage.

Wentworth has compiled[1] a series of over eight hundred histograms of sediments of all classes, where necessary converting the original determinations by other observers to the same fractional units employed in Fig. B, except that in the latter diagram the vertical scale of representation has been reduced, for convenience, to one-quarter that employed in current laboratory practice. Comparison with Wentworth's eleven graphs of loess from Iowa reveals the same abrupt pronounced rise to a maximum just below 1/16 mm. followed by a more gradual step-down to below 1/128, found in the North China samples. This distribution of size-ranges appears to be characteristic of the finer wind-borne sediments and is further proof of the aeolian origin of the loess under discussion.

Climatic inferences

In a paper written in 1930 an attempt was made to relate the fluctuating history of erosion and deposit to an inferred series of climatic tendencies.[2] The more recent detailed work on the fossil horizons by Teilhard, Young, and others throws light on complexities not previously recognized. It is possible locally to identify six post-Miocene epochs of deposition. The graph (Fig. C) showing these epochs as now understood is based in part on the revision given in the "Memoir on Fossil Man in China,"[3] modified to include the newer evidence.[4]

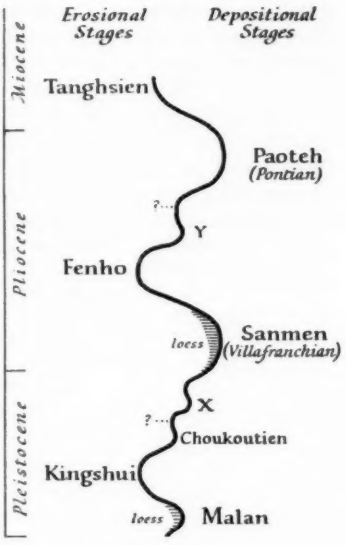


Fig. C. The rhythm of sedimentation as suggested by identification of six distinct faunal assemblages. (Not drawn to scale)

The climatic changes which accompanied this history of fluctuating sedimentation still present acute problems. The earlier Pliocene deposits and their fauna unquestionably indicate conditions more tropical than those of to-day. The late Pleistocene loess belongs to a distinctly more rigorous climate, both a little more arid and colder than the present, such as might be expected if the likely correlation with the Wurm glacial epoch is accepted.

The chief problem centres round the late Pliocene and early Pleistocene loessic loams. The fossil soil profiles with calcareous horizons demand a

[1] C. K. Wentworth, "Mechanical Composition of Sediments in Graphic form," *Univ. Iowa Studies Nat. Hist.*, vol. 14, No. 3, 1931.

[2] G. B. Barbour, "Taiku Deposits and the Problem of Pleistocene Climates," *Bull. Geol. Soc. China*, vol. 10, 1930, pp. 71–104.

[3] Davidson Black *et al.*, *Geol. Surv. China, Mem.* 11, 1933, pp. 50–1 and Fig. 28.

[4] P. Teilhard and W. C. Pei, *Bull. Geol. Soc. China*, vol. 13, 1934, p. 387.

relatively low rainfall which is supported by the interpretation of the mass of the loessic material as a wind-transported accumulation. On the other hand, the reddish colour banding agrees with some of the faunal evidence in suggesting a warmish climate. The Choukoutien fauna points to a milder and damper climate than that of to-day, but the restriction of the fossiliferous deposits to cave-fillings and slope accumulations incised in Samenian terraces shows that the physiographic conditions were no longer typical of those obtaining at the opening of the Pleistocene. Between the major Sanmen aggradation and the Malan loess deposition came a stage of vigorous dissection (Kingshui stage), but the absence of deposits of undoubted Choukoutien age from localities where this dissection is most evident physiographically leaves us still in doubt whether the marked increase in precipitation came before the Choukoutien or after it. Faunally and lithologically the Choukoutien is more closely related to the Sanmen than to the Malan. Physiographically the link with the Malan is the closer.

Aside from this important detail, the general trend is from warm semi-arid climate in lower Pliocene with increase of rainfall in the middle of the period to somewhat cooler and distinctly drier conditions at its close. Towards the close of the Lower Pleistocene, slight increase in moisture led up to the Choukoutien stage which was followed by an epoch of dissection before the onset of the cold semi-arid loess days of the Malan stage. The transition to the present conditions began at the close of the Pleistocene.

REVIEWS

EUROPE

IN PRAISE OF MANXLAND. By MAXWELL FRASER. *London: Methuen & Co.* 1935. $7\frac{1}{2} \times 5$ *inches;* xii+276 *pages; illustrations and map.* 7*s* 6*d*

Apart from crowds of holiday-makers, with whom the author is in the main sympathetic, the Isle of Man is a splendid place for the quiet tourist in search of health, scenery, and antiquities. The people invest their beauty spots with legends—few are without them—which make heavy demands on the faith that can remove mountains: thus "it is said that when the Cloven Stone hears the bell of Kirk Lonen ring, the two sides clap together." The pleasant places which cater whole-heartedly for amusements and "attractions" are not in total effect much spoilt, though it is perhaps time to protest when the names Weeping Rocks, Wishing Stone, etc., are painted up on their respective rocks. Here is sophistication in Arcady, but it is generally done "with such an ingenuous air that it disarms criticism." Most of the island however is innocent of "attractions." Beautiful and neglected glens and highways are many. And are there not the Manx Highlands? And inscribed stones of Celtic or pre-Celtic times, many of which still await deciphering? The author praises not only places, but famous Manxwomen and Manxmen, such as T. E. Brown, whose letters and poems are *par excellence* the shrine of Manx national characteristics, traditions, and scenic beauties. There is an eloquent chapter on him at the end of the book. Good writing, a combination of sobriety and enthusiasm in description, and rich subject-matter make this an excellent guide-book, which should persuade many to enjoy the lovely glens, many antiquities, fairy lore and history of Man. "There is a 'fishermen's walk' running down from the highway to the sea in the neighbourhood of every coastal glen on the island." S. E. W.

COLONSAY AND ORONSAY, IN THE ISLES OF ARGYLL. By JOHN DE VERE LODER. *Edinburgh and London: Oliver and Boyd* 1935. $10 \times 6\frac{1}{2}$ *inches;* xxxii+472 *pages; illustrations and maps.* 35*s*

This sumptuously produced volume, with its 125 illustrations and an excellent map by Bartholomew on a scale of $2\frac{1}{2}$ inches to the mile, must surely contain every available scrap of information about Colonsay and Oronsay. In particular the history, both documentary and traditional, is set forth in great detail, with the inevitable result that much of it is not peculiar to Colonsay and Oronsay but relates to the Hebrides and even to Scotland generally. Not only is a full bibliography provided, but the author has printed in full many original documents (some hitherto unpublished), pertinent extracts from descriptions of the Hebrides by various authors, a flora and fauna, a digest of the Geological memoir, etc.

The author states in his preface that his intention has been "to collect and arrange all the available information." This task has doubtless been accomplished, and for this reason the book will not interest the general reader so much as the specialist, while the geographer must make his own synthesis, for the author has been more concerned with the chronicling of facts than with their interpretation. R. M.

THE TRAVELER'S RUSSIA. By BURTON HOLMES. *New York [and London]: G. P. Putnam's Sons* 1934. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* x+246 *pages; illustrations.* 10*s* 6*d*

In 'The Traveler's Russia' Mr. Holmes describes what he saw of the U.S.S.R. during three weeks of April and May 1934. His journey was made under the

auspices of the Intourist organization and he followed their advice in arranging for *de luxe* accommodation in hotels and trains throughout his tour. His experiences seem to indicate that all those who require comfort and cleanliness should do likewise.

Intourist "girl-guides" served him as interpreters, since Mr. Holmes does not speak Russian. Most contemporary visitors to Russia travel under similar conditions, and from this point of view the book is informative and will probably be useful to many. The author enjoys the advantage of being able to compare the Moscow and Leningrad of to-day with the same cities as he knew them during a longer sojourn in 1901, and the contrasts are illustrated by excellent photographs taken at both periods. Old churches which have now been destroyed, or have fallen into a sad state of disrepair, are given as much attention as the office buildings of the Soviets.

Mr. Holmes spent a week in Moscow, where he witnessed the May Day celebrations, then travelled south *via* Kharkov to the Crimea and motored along the coast of the Black Sea. After taking a boat from Yalta to Odessa he returned to Moscow through Kiev and finally paid a short visit to Leningrad. The author is at his best in straightforward descriptions of places and events; his digressions on the virtues and failings of the communist system are based on too superficial an acquaintance with the country to be of great interest.

The theatre and the ballet arouse his keenest admiration and he pays a tribute to the young women of new Russia as exemplified in the "girl-guides" to whose efficiency much of the success of his journey is clearly due. More than once the author succeeds in conveying a vivid impression of the atmosphere of a particular scene, such as the interior of Lenin's mausoleum, or the vast "club room" of the largest student dormitory in the world, which looks "like the inside of an empty automobile factory" and where "everything is plain, repellent, institutional." Near Odessa he is shown a prosperous pig-farm and also an attractive *crèche* in charge of three capable-looking women, where some forty or fifty infants are left every day while their mothers are working in the fields; but at a communized farm "we saw little to convince us that Russian agriculture is on its way to anything more than hard work and mediocre crops."

The author had been told that photographing was permitted nearly everywhere, but more than once the use of his camera led to trouble with policemen and others. On the first occasion the officer of the law demanded his papers, but "I have no papers. My passport is held at the hotel and Intourist has declined to give me any letter of identification, saying it is not necessary." He was released after two hours of mild adventures, but naturally resolved to have his Intourist "girl-guide" with him before attempting a snapshot again. Mr. Holmes concluded that it was the policeman, and not himself, who was under a misapprehension, although several other policemen shared it: "one small cop who does not know that photography is *not* forbidden, can make a lot of trouble for the traveler."

The grouping of a large number of photographs together, instead of scattering them through the book, is an innovation of doubtful success, especially when many of the pictures are without margins, for they are thus too close together to be seen to the best advantage. E. J. L.

ESBÔÇO DUMA CARTA REGIONAL DE PORTUGAL. By ARISTIDES AMORIM GIRÃO. 2nd edition. *Coimbra Imprensa da Universidade* 1933. 9×6 *inches; 224 pages; maps*

Few geographical studies, however meritorious they may be, achieve popular success to the extent of exhausting the first edition within a month or two.

The study under review, of which we have the second and amended edition to hand, had such an experience and therefore demands careful reading.

Amorim Girão is the Professor of Geography in the University of Coimbra. This Esbôço ranks as the fullest of his long list of geographical studies of Portugal. In his position as present leader of the "Coimbra" school of Portuguese geographers he is intensely interested in problems of regional geography, while the "Lisbon" school centres its interest largely on economic and colonial geography. This study, "A Sketch for a Regional Map of Portugal," began to appear in Biblos as early as 1926 and was finally launched as a complete book at about the time when two official commissions were set up: one to make an agricultural division of Portugal into regions, the other to prepare a scheme for re-drawing provincial boundaries. The set of interests so affected and the high merit of the study, the only one of its class in Portugal, assured its success quite apart from the excellent literary value of its style. Quite logically the study opens with comments on regions, regionalism, and criteria, and we are convinced that there exists no "regional problem" such as Spain has with Catalans and Vascos. In these comments we find the background in front of which Girão takes his position, and it is significant that the references are nearly always to Brunhes, Vidal de la Blache, and a whole body of French geographers. Can the contribution and technique of the German school (Passarge, for example) to the concept of geographical regions be completely omitted in a broad discussion of regional theories? Girão, at any rate, makes no reference to German work, while showing himself familiar with the English group as represented by Herbertson and Unstead. As a result, perhaps, of this French influence, the style is good and the word-pictures of the various regions beautifully developed. It was Brunhes himself who said that scientific geographical writing was quite compatible with artistic treatment, so that Girão, his disciple, gives us firmly written, colourful prose with a severe choice of material.

If the word-pictures, on the one hand, are unimpeachable, we may question the poverty of the book in maps and diagrams. Only six simple maps are given, one a coloured relief map with regional divisions shown; the others larger-scaled planimetric outlines of subregions. That is one reason why closer acquaintance with German or American technique would have been of great assistance in the presentation. Regional geography does not finish with discussions of limits and subdivisions, with weighing up of factors and influences. The main business of regional geography begins precisely when the delimitation ends: the character of each unit has to be brought out by every artifice available in cartography, sketch-maps, block diagrams, well-chosen photographs, and the written word. We are certain that, granting necessity for economy in printing costs, Girão could have better presented aspects of his regions by more efficient use of the same area of printers' blocks. This deficiency of maps is the more surprising since on p. 154 the author emphasizes their importance as bases for regional synthesis. So far as maps are concerned, Girão refers justly to the great importance of Barros Gomes, whose 'Cartas elementares de Portugal' (1878) is indispensable to (and unprocurable by) every student of Peninsular geography. A comparison between Barros Gomes' regions and those of Girão naturally follows. Girão insists on the quality of river basins as regions in themselves whereas Gomes used rivers as limiting features. Thus Girão has an Alto Douro, a Baixo Douro (lower Douro), and the Ribetejo (lower Tagus). That recognition of fluvial basins constitutes the main variation of Girão's regions from those of Barros Gomes, the only other—apart from realignment of some margins—being that Girão simplifies into one large region the country north of Algarve—Baixo Alentejo. Stated fully, Girão's regions of Portugal are: Minho, Trás-os-Montes,

Alto Douro, Baixo Douro, Beira Litoral, Beira Alta, Beira Transmontana, Beira Baixa, Ribetejo, Estremadura, Alto Alentejo, Baixo Alentejo, and Algarve.

The division into subregions, while remaining properly elastic, is done so well that the character of the region as a whole becomes fully drawn. For example, in the Minho region (north of lower Douro) he discusses the relative values between subregions parallel to the coast (differing in crops, vegetation nature and climate), and subregions normal to the coast (based on rivers, land forms, transport, and human gravitations), with the result that a clear notion of the region is created. He uses much of the technique of Gallois here, bringing to bear a wide knowledge of *nom-de-pays*, local speech variations, local farming character, and typical dress.

In total, no other book has yet provided so clear a picture of Portuguese geography, and this Esbôço justly ranks in Portugal as a standard work of its class, a worthy contribution of Coimbra to modern geography. Girão has to be further complimented on having stated his views clearly and scientifically without florid flights of regional flattery or patriotism such as so often mar peninsular studies of this type. E. H. G. D.

THE BLUE DANUBE: Black Forest to Black Sea. By BERNARD NEWMAN. *London: Herbert Jenkins* 1935. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 316 *pages; illustrations and sketch-maps.* 10*s* 6*d*

This is a fascinating travel book, tracing the Danube from its stolid and respectable German home through its wild vagaries in Central and Eastern Europe to its end in the Black Sea. The author bicycled a great deal of the way—though he shot the Iron Gates by mistake in a rowing-boat—and very little that goes on in a Yugoslav, Bulgarian, or Rumanian village seems to have escaped his notice. He played in a gipsy band in Rumania, was attacked by a vampire—or was it a goat?—in the Carpathians, and became an authority on Balkan, especially Rumanian, football: nearly arrested for murder in Belgrade, nearly murdered himself in Bulgaria. The book is written charmingly, Mr. Newman taking himself and his adventures neither wholly seriously nor wholly frivolously. He has a great affection for the people he met, and he is plainly a man of the widest sympathies. With no particular political bias he makes some shrewd observations on the dangers and the possibilities of the immediate future in Eastern Europe: and his panegyric of the pre-Fascist housing-schemes of Vienna is a reasoned and moving tribute to the departed glories of the Austrian Social Democracy. The illustrations are good, particularly those which show the various gypsy types which Mr. Newman met all along his journey, many of whom look as though they had only a fortuitous connection with Europe.

M. C.

NEDERLAND: Handboek der Aardrijkskunde. By R. SCHUILING; with H. J. MOERMAN and G. J. A. MULDER. Sixth Edition. Part I. *Zwolle: J. J. Tijl* 1934. $10\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xx+822 *pages; illustrations and maps. Gldn.* 15

In English geographical literature there is a marked lack of a detailed study of the Netherlands. This may be accounted for in part by the specialized nature of the problems to be treated, and, to judge from the bibliographies contained in the work under notice, by the vast amount of literature in Dutch to be mastered. The first edition of this work appeared fifty years ago, and it must have been particularly gratifying to the author to have been able, with the collaboration of a new generation of students, to publish the sixth edition of what is obviously a standard work.

It is not the purpose of this note to attempt a critical review of this encyclo-

paedic work, but merely to bring it to the attention of British geographers and to indicate briefly its scope and arrangement. Its scale is perhaps its only disadvantage, for the inclusion of surveys of general geographical principles, and of the history of the relevant sciences in the Netherlands, tends to make it somewhat diffuse. The first portion treats of the general characteristics, physical, biological, and anthropological: here the scale is naturally governed by the special conditions of the geographical environment. Thus by far the greater part of the geological section deals with the diluvium and later, and the hydrology receives equally detailed discussion. The general theme therefore is not only the struggle with the sea, but with the coincident threat from the Rhine and other rivers.

The second part contains the first group of regional studies, those on the eastern, central, south, and south-east Netherlands, and the area of "river clay." The historical and human aspects, particularly the forms of settlement, *e.g.* upon the peat moors, are strongly emphasized. The second volume will contain the remaining seven regional sections, and chapters upon the economics and the life of the people. The work is well illustrated, and is furnished with detailed maps. On its completion there should be little excuse for ignorance of the Netherlands among geographers. G. R. C.

MODERN AUSTRIA: As seen by an Englishwoman. By CICELY HAMILTON. *London: J. M. Dent & Sons* 1935. $7\frac{1}{2} \times 5$ *inches;* xxii + 230 *pages; illustrations and sketch-map.* 7*s* 6*d*

Miss Hamilton has already written about Russia, Germany, Italy, and France in this same series, so that it is clear that she is not afraid of political themes. In Austria she has found perhaps more confusion than in any of the other countries of which she has written. Here Fascist fights Fascist and Nationalist fights Nationalist, until the ordinary observer gives up the attempt to understand the situation in despair. Miss Hamilton gives an extremely balanced account of Austria, inclining neither to the Socialist, Fascist, or Legitimist solution, but stating the aims, chances, and justification of each party with fairness and candour. She grasps the kernel of the situation when she draws the contrast between the forward-moving, urban life of Vienna and the traditionalist, rural existence of the large peasant proportion of the population: this is for her the sum of the difference between Socialism and either Fascism or Legitimism, and she refuses to be blinded by the violent partizan statements of any party.

In her appreciation of the Austrian countryside and the architectural beauties of Vienna Miss Hamilton echoes the feelings of an increasingly large body of English people for whom the Salzburg Festival has made Austria a place of yearly pilgrimage, and others who have discovered in the Tyrol and Vorarlberg a cheaper alternative to winter sports in Switzerland. 'Modern Austria' is altogether an excellent book—informative, appreciative, well balanced, and pleasantly written. M. C.

CRUISING IN THE MEDITERRANEAN. By W. J. ARCHER. *London: Jarrolds* 1935. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 252 *pages; illustrations and sketch-maps.* 12*s* 6*d*

TWO MONTHS' GRACE. By PETER STUCLEY. *London: Selwyn and Blount* 1935. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 176 *pages; illustrations and sketch-map.* 7*s* 6*d*

Mr. Archer seems to have touched at almost all the ports in the Mediterranean and to be familiar with the history of each of them. His book is informative without being a text-book of either history or geography: and given his subject, it is perhaps unfair to expect great originality, though occasionally his informative style takes on a little of the atmosphere of the conducted tour.

Mr. Stucley's 'Two Months' Grace' is a lighter and more frankly superficial work, with vignettes of local life (and tourist contributions to it) and a purely personal and unacademic approach to each place and situation. Mr. Archer writes of Olympia, for instance, "The renown of Olympia is due to its being the centre of the games which have for millenniums borne its name"; whereas Mr. Stucley ". . . among the fallen grey pillars grow a mass of red anemones, wild irises and a forest of white daisies. . . . One cannot imagine how energy was found for the Olympic Games in such a place. It has the languor of a lotus land." The difference between these two passages is, in short, the difference between the two books: there is no doubt a demand for both kinds of writing, and of its kind each of these two books is a fair example.

ASIA

WHERE CHINA MEETS BURMA. By BEATRIX METFORD. *London: Blackie & Son* 1935. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+232 *pages; illustrations and sketch-maps.* 12*s* 6*d*

The author offers no original contributions to the geography of Burma and China, and her field of travel is limited to a section on either side of the long line of this wild frontier. Her husband is a British official, and she has set down in a pleasing and unaffected manner her experiences and observations at the stations where they have lived and on the journeys when she accompanied him on tour. Her earliest experiences were among the Kachins at Sinlum, about 20 miles east of Bhamo. The reader is taken for a tour in the Kachin Hills, and later to Namkham to attend a typical Anglo-Chinese frontier meeting, which adjusts and clears off the year's outstanding local tribal disputes and claims on either side of this frontier, and it is here that acquaintance is made with Chinese, Shans, Palaungs, and others. The story (p. 84) of the mythical dragon of Meng Mao seems to indicate prehistoric serpent worship, and the legend of their gold-plated teeth recalls the letter sent to Queen Victoria in 1871 by the rebel Sultan at Talifu, 15 marches north-eastwards, in which he describes himself as "of the golden-teeth country." The ancient capital (Vochan) of this country is the present city of Yungchang, about 100 miles south-west of Tali and just outside the eastern limit of the author's itineraries. Mrs. Metford also takes us on visits to Tengyueh, the Chinese Shan States, and the reaches of the Salween river inhabited by Li-su tribes. Her keen interest in her surroundings and graphic descriptions of what she sees and hears make up an attractive record. The book is printed clearly and well illustrated by selected photographs: a sketch-map is also attached. E. C. W.

THREE YEARS' WANDERINGS IN THE NORTHERN PROVINCES of China, including a visit to the tea, silk and cotton countries . . . By ROBERT FORTUNE. *Shanghai: University Press* 1935. $9\frac{1}{2} \times 6$ *inches;* xvi+376 *pages; illustrations and map. Sh.*$22.50

The University Press deserves the thanks of every one interested in Great Britain and China for having reprinted this book written by Robert Fortune after his first visit to China more than ninety years ago. It was first published in London in 1847 and copies of the original are very scarce to-day. The author was born in Scotland in 1813 and was appointed collector to the Royal Horticultural Society in 1843 for a special visit to China: this expedition was the forerunner of three others to the same country. The Society was fortunate in its choice, and he added much to the knowledge of the flora of the Far East. Some idea of his zeal and fitness for his task may be gathered from the fact that he

brought to England nearly 200 species and varieties of plants of which 120 were entirely new to the West.

The text remains the same as in the original work, which is in no sense a dry record of botanical discoveries. On the contrary, the simple and straightforward manner in which the narrative recounts his adventures, experiences and impressions will hold the reader's interest from the first page to the last.

The author arrived at Hongkong a year after its cession to Great Britain, and he takes us with him to the eastern mainland ports of Canton, Amoy, Foochow, Shanghai, and Ningpo, as well as the Chusan islands off the mouth of the Yangtse. Mr. Fortune however was not content to rest in these places and pick up his information from others, but chose to acquire first-hand knowledge from his own observations during numerous excursions and journeys inland. His practical training, added to his native shrewdness, courage, and tenacity, enabled him to carry out his task in spite of the general suspicion with which a stranger in China was in those days hedged around, and his working knowledge of the Chinese language picked up during his wanderings became of considerable assistance to him.

A map and sixteen illustrations are included and the publishers have reproduced the original plates as faithfully as possible. There is a list of contents at the beginning of the volume, but an index would have added to the value of the work. It is to be hoped that the publishers will be encouraged to reprint Fortune's second book 'A Journey to the Tea Countries of China,' which records his second visit in 1848 on behalf of the East India Company. E. C. W

AFRICA

THE ANGLO-EGYPTIAN SUDAN. By Sir HAROLD MACMICHAEL. *London: Faber and Faber* 1934. 9 × 5½ *inches;* 288 *pages.* 15*s*

This is an authoritative book in eminently readable form, and it has appeared at an opportune moment. The author, for some years Civil Secretary in Khartoum, following varied services in the provinces, has recently left the country to become Governor of Tanganyika. He has thus been able to write from his enormous store of knowledge still fresh in his mind, and yet with a suggestion of detachment. The result is most satisfactory. Although the book is written in historical vein, the Olympian days of the nineteenth-century tragedies and final victory are treated succinctly without losing their realism. The intricacies of the condominium are explained and the trend of recent developments is carefully followed. We are given a glimpse, usually lacking in such books, of the native miscellany that makes up the Sudan, and of the ancient past of the country. The author sees in twentieth-century rule the most successful attempt to govern the country for the good of its inhabitants, and he sees it as only one of a number of attempts, not so disinterested, in the last four thousand years: he adds the historian's query as to the future.

Restrained as the style certainly is, one feels that the writer is not so happy about the next forty years as he is about the days since 1898. The native, even the care-free black, is beginning to learn something of the material progress of settled government and of discouraged slavery. Large numbers of young men have passed through Gordon College, some to Government service, others to find that they cannot be absorbed. A political consciousness is growing: can it be guided into progressive channels, and can petty selfishness and stupid opposition be avoided? The vast majority of the people are content and thriving in the enjoyment of their own institutions under the watchful eye of the district commissioners and their seniors in the provinces, while a technical staff is

developing the natural resources. The author sketches the character of his ideal district officer: the country, in practice, seems to be full of them, and it is greatly to be hoped that their number will not be reduced to danger point. A few pages in the book show clearly enough that the country is also full of potentially explosive religious fanaticism, and that it has to be handled as carefully now as it was mishandled, with other inflammable material, in the last century.

For those who have the financial welfare of the Sudan at heart or look to it as a source of raw material or a market, some highly instructive, and, on the whole, encouraging facts and figures are included: these might usefully be augmented to form some valuable statistics and appendices. The book is an indispensable introduction for any one seriously interested in the country, its history and development, government and possibilities. There is an adequate index: a tribal map and a larger and better folding-map would be welcome additions. Cover, type, and paper are in the publisher's usual pleasant and plain good style. K. S. S.

ALS NATURFORSCHER IN OSTAFRIKA: Schilderung einer Expedition zum Mt. Elgon, Rudolfsee, Omo-Fluss. By P. A. CHAPPUIS. *Stuttgart: E. Schweizerbart (Erwin Nägele)* 1935. 9×6 *inches; 120 pages; illustrations and route-maps. M.5*

M. Chappuis, a Swiss hydro-biologist, gives a concise, general account of a recent expedition through Kenya and Turkana to the Omo river. The objective of the party, organized by the French scientists MM.Arambourg and Jeannel, was the deposit of fossil remains of the Dinotherium discovered by Du Bourg du Boyas in 1903 near the northern end of Lake Rudolf, from which they desired to procure specimens. The interest of these remains is that, though of Pleistocene age, they are comparable with fossils from the Miocene found in Europe and elsewhere. The author's interests lay in studying the paleo-arctic relict fauna of the waters, to trace the links between the Central African highlands and Abyssinia. In the course of the journey he was able to spend some time on Mount Elgon, ascending to the crater, and in the Cherangani Hills.

The climax of the book is the protracted negotiations with the local Abyssinian chief, who was very reluctant to allow them to cross the frontier. With the active support of the British authorities however his scruples were overcome, and the object of the expedition achieved. There is an interesting description of the province of Turkana, and of the organization of British control. A good portion of the book is concerned with the incidents of travel in East Africa, and of present conditions in Kenya. The author also discusses briefly the question of the levels of Lake Rudolf, the drying-up of Sanderson Gulf, and the advance of the Omo delta. The Gulf was already a reed-covered swamp when Sir Arnold Hodson visited it in 1925.

As a straightforward account of a journey in a lesser-known part of Africa, this short book should interest the continental public, for which it is designed. It contains a number of clear photographs. G. R. C.

THE MAGIC GATE OF THE SAHARA. By ANGELO PICCIOLI. Translated from the Italian by ANGUS DAVIDSON. *London: Methuen & Co.* 1935. 9×5½ *inches; x+306 pages; illustrations and sketch-map. 12s 6d*

The Italian Sahara is a land of mystery to the Englishman; we have been treated fitfully for the last thirty years with disconnected news items about it—with desert wars, Roman Ruins, and great schemes for revival and re-colonization—and I for one expected hopefully to read at last an informative book about a part at least of the country; the more hopefully since the author is stated in the

publisher's note on the wrapper to have been formerly in the Italian Ministry for Colonies. But he visited the country as a tourist and describes the impressions of a virgin sightseer who has never previously left Europe. As a result so much space is devoted to "atmosphere" and "colour" that the book rather resembles the sad English idea of an *omelette au jambon* in which a few little bits of meat are to be found with difficulty buried in a mass of froth. This is not to say though that some of the pen-pictures and descriptions of personal impressions are not excellent if taken a few at a time; but there is too much of it. And why do authors of avowedly popular travel-books introduce native words for common things on every page and so make the poor lay reader keep turning back to the glossary? Surely the use of foreign words, except in books written chiefly for the initiated, should be reserved for the untranslatable.

Though the publishers assure us that the author's travels were unofficial and solely for pleasure, it is difficult for the English reader to avoid the suspicion that the book, if not written to order, voices an officially moulded outlook. It is this outlook which to my mind provides the main interest in the book. The natives are regarded cynically as a quaint and picturesque but dying survival of barbarism, a mere hindrance in the way of European colonization. A study of their history and ethnology is regarded as unnecessary, and the archaeology of the country, other than Roman, as a waste of time. It may be though that we have grown old and decadent in our point of view. After all, it is one's own national welfare that should matter most, and the enthusiasm with which the author depicts the re-awakening of Lybia through Italian drive and patient industry is certainly refreshing.

A third of the book is taken up with a series of sketches of the town of Tripoli; then follow impressions of a journey by car from here to Gadames in the interior, and lastly there are several chapters describing Gadames from various angles. An end-paper map illustrates the journey and includes a fair proportion of the places mentioned in the text. There are some good photographs, but many savour rather of the picture-postcard. R. A. B.

THE WINNING OF THE SUDAN. By PIERRE CRABITÈS. *London: George Routledge & Sons* 1934. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+280 *pages; folding map.* 12*s* 6*d*

This book is another of the remarkable series that the author is publishing through the house of Routledge. It is fascinating reading. In the first half the well-known story of the retirement from Khartoum, the evacuation, the years of preparation, the advance and conquest is told once more. The ground has been covered many times and yet this account is a living document that proves most absorbing, with interesting items of little-known events and personal history on every page. The author conducts his readers along the devious paths of the contemporary international politics with a frankness that is refreshing: he looks at Mediterranean and African rivalries with the detachment of the New World. He can say with judicial impartiality what nationals of European Powers would hesitate to write, and the truth in print is sometimes depressing. In the same judicial spirit he defends some events that others would bluntly condemn. The international significance of the advance from the lines of Wadi Halfa and from the Atbara is more clearly and more uncompromisingly stated in this book than in any of the same type known to the reviewer, and it should be read with special interest at the present time.

The second half of the book deals with the troubles bred by the reconquest. When the Nile was in savage hands from Victoria and Tana to Wadi Halfa civilization took what water the gods sent. With the headwaters in political security people began to wrangle, and they have been doing so ever since. There

are some unhappy passages in the story, and the author clarifies some of them though he does not gild them. He can write about the Sudan without official reserve: he does so. He has an unbounded admiration for the British soldiers and administrators who have toiled in that country, but the prospects of a Sudan flowing with milk and honey depress him. His account of the Gezira scheme and cotton-growing in other districts is perhaps unduly pessimistic, but it was written at the depths of the trade depression. The metaphor of the game and the candle, which he employs at length, is a little forced and not very clear. The few misprints and inexactitudes or debatable statements are of no real importance in a book that is so interesting and informative, often vigorous, from cover to cover. A commendably large and clear folding map is provided, but it is devoid of topographical detail, frontiers, etc., which it might have contained without overcrowding, and nearly every name is accompanied by a black circle, whether it be in fact a town, or a district or tribe. Still, it is a relief to get a large clear map. The author has made excellent use of his special facilities in Cairo and he and his publisher are to be congratulated on the appearance and contents of this admirable volume. K. S. S.

SPEAK TO THE EARTH: Wanderings and Reflections among Elephants and Mountains. By VIVIENNE DE WATTEVILLE. *London: Methuen & Co.* 1935. 9×5½ *inches;* 336 *pages; illustrations and maps.* 15*s*

During the last quarter of a century books in great number have been written about East Africa but none on quite the same lines as 'Speak to the Earth.'

What is brought out of a country depends to a large extent on the equipment taken in, the mental equipment being more important than any other. Miss de Watteville's equipment included a mind trained to observe; an understanding of the ways of natives and animals gained from experience; and above all a boundless faith in the innate friendliness of all beasts, dangerous or otherwise, a belief that if contact could not be established it would be because of something lacking in the human being rather than in the animal. The result is a book of absorbing interest and of hairbreadth escapes told with all modesty as a part of her experiences.

Miss de Watteville went to Kenya Colony and Tanganyika Territory (it would seem in 1928), not to shoot, as on a previous expedition about which she wrote in 'Out in the Blue,' but unarmed and with quiet steady courage to make friends with all wild animals, above all with elephants. In this she succeeded to a wonderful degree, though she confesses that as far as elephants were concerned "the problem of making friends with them had really no solution." But that did not prevent her spending hours in their company, watching them fighting and playing, retreating only when to remain would have meant the end of all observation.

So by ignoring danger Miss de Watteville observed in closest proximity elephants, lions, rhinos, and a host of less dangerous beasts, and with the gift that seems to be given freely to the lovers of solitude and of the far horizon has described her experiences in vivid and beautiful language.

There is much besides. Miss de Watteville being an enthusiastic mountaineer added to her exploits by climbing Ol Doinyo Orok, the black mountain on the borders of Kenya and Tanganyika, and by a remarkable lone sojourn in a hut on the slopes of Mount Kenya almost within reach of the summit and among glaciers and glacier-lakes where, as the result of a disastrous fire which demolished all vegetation for miles around, she more nearly than at any other time formed contact with the animal world, for the small oasis she saved from the devouring flames became a refuge for birds and animals on that side of the mountain.

This is a fine book. One at least of the beautiful photographs proves, if such proof were needed, how near Miss de Watteville approached the most dangerous of beasts, and excellent must in all probability be the cinema films, examples of which readers are not privileged to see. E. W. N.

ANCIENT EGYPTIAN MATERIALS AND INDUSTRIES. By A. LUCAS. Second Edition, Revised. *London: Edward Arnold & Co.* 1934. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+448 *pages.* 16*s*

This book is described as a second edition of the same author's 'Ancient Egyptian Materials,' reviewed in the *Journal*, vol. 69, p. 470; but it is much more. The word "Industries" has been added to the title and covers an important change beyond the expansion and revision that might be expected to result from eight years' work.

The real value of the book still lies in the detailed and critical examination of materials, a vast number of which have been subjected to chemical, microscopical and other tests to determine their exact nature. Many of these tests have been carried out by the author, an expert chemist, but other experts have been called in for such work as the identification of woods. Those who have a scientific knowledge of modern timber will not be surprised to learn that much ancient Egyptian "cedar" is really juniper. It is interesting to note that the name "ebony" is an ancient Egyptian word, one of very few of that derivation now in general use. As an example of the author's admirable caution we may cite the chapter on cosmetics, where, unfortunately, many of the results obtained are negative: but a negative result may be interesting and valuable; the suggestion that a resin was used as a base for cosmetics is disproved: Mr. Lucas made some and found that they would not adhere to his face! In the chapter on precious stones it is shown that emerald or beryl was not used before Ptolomaic times; jewels of earlier date have been identified as such by Egyptologists, but are a greenish felspar (microcline or "amazon-stone"). At no period were beryls cut, the stone being too hard; Cleopatra's emeralds were the natural prismatic crystals. The method of making paper from papyrus is not yet fully known despite careful experiment by the author, and several other subjects requiring further investigation are noticed.

The general discussions of various industries, which form the really new part of the book apart from revision and expansion, are of great interest and convert a book of reference into a well-documented but thoroughly readable treatise.

C. N. B.

PALEOLITHIC MAN AND THE NILE VALLEY IN UPPER AND Middle Egypt: A Study of the Region during Pliocene and Pleistocene Times. By K. S. SANDFORD. (Oriental Institute Publications, Vol. XVIII. Prehistoric Survey of Egypt and Western Asia, Vol. III.) *Chicago: University of Chicago Press* (*London: Cambridge University Press*) 1935. 12×9 *inches;* xxii+132+xxxix *pages; illustrations and maps.* 31*s* 6*d*

In relating the existing régime to that of the past, the fact that the science of Physical Geography originated in the glaciated regions of north-western Europe has for a long time obscured our perspective. The Ice Age was an interruption of the orderly sequence of physiographical development and as such obscures the immediate foreground of our historical survey. An investigation such as that described in the volume under review is therefore of considerable interest, since it records the sequence of events in the development of a great river in terms of the best of all Pleistocene chronologies, that based on the development of man's industry.

It is now about ten years since Dr. Sandford made his first expedition to Egypt and announced the remarkable discovery that the Nile shows a similar, but even more complete, succession of Palaeolithic terraces than the Thames and Somme. This parallelism of development between regions so distant is striking enough in itself and affords much ground for thought; but Dr. Sandford's more recent researches have so elucidated the geological and archaeological history of the Nile that it now forms a better standard of reference for palaeolithic chronology than our north-western European rivers.

The Nile Valley first records itself in geology as a gulf of the Pliocene Mediterranean extending south through Middle Egypt amidst plateaus of Eocene limestone. The sediments of this gulf remain approximately horizontal to the present day, and so give an impression of long-continued stability, justified also by the study of later deposits. We need not concern ourselves greatly with them, except to note discordances due to lowering of sea-level, separating respectively the Middle and Upper Pliocene and the Upper Pliocene and so-called Plio-Pleistocene, in the latter of which material from the Red Sea Hills first mingles with the sediments, thus making the series easily identifiable. Subsequent valley erosion or degradation is marked by a series of terraces at levels from 765 feet above the present alluvium downwards. In conformity with former practice a terrace at 300 feet is assumed to mark the beginning of the Quaternary and to be equivalent to the Sicilian terrace of the Mediterranean, which has a corresponding altitude and relation to the Pliocene. There is still no trace of man, nor do his implements appear in the succeeding terraces at 200 feet and 150 feet, the first of which is tentatively equated to the Milazzian.

Chellean or Abbévillian man made his first appearance at the time of the 100-foot terrace, and during its formation he advanced his technique to the stage known as early Acheulean. A coarse flake industry of Clactonian type is also present. Coincidence of level suggests correlation with the Tyrrhenian of the Mediterranean and similarity of industry with the 100-foot terrace of the Thames and Somme, and suggests the question whether Depéret may not have been essentially right after all. The answer is that he probably was, within a certain stable area in Africa and Western Europe, but certainly neither in the orogenically nor in the isostatically affected areas into which he pushed his correlation.

A still further correspondence with the Thames lies in the occurrence of a 50-foot terrace with advanced Acheulean industry. The Monastirian is regarded as the Mediterranean equivalent. A novel feature however is the occurrence of Mousterian terraces at altitudes of 30 feet and 10 to 20 feet, the former with Early and the latter with Late Mousterian implements. Between the formation of these two terraces however came a period of degradation during which the river reached an unknown low level, probably not far below present low water.

These terraces, as far as they have been traced from the Delta to Upper Egypt and Nubia, are remarkable in that they maintain a uniform level above the recent alluvium. Moreover they pass into gravels with similar implements which can be traced up the wadis and bear witness to the occurrence of lateral tributaries and liberal rainfall all along the Nile. The conditions in the Upper Palaeolithic were quite distinct. A sheet of silt, similar to the modern alluvium and originating in the Upper Nile, was brought down by the river and spread right into the mouths of the wadis, which since they made no contribution to it in the form of interbedded sands and gravels must at that time have been dry. The gradient of the surface of these silts is much greater than that of the alluvium. At the south end of the Second Cataract in Nubia it lies 100 feet above the alluvium, descends to 20 feet at Luxor, and between Luxor and the Fayum

drops farther to 20 feet below the alluvium. The contained industry is not the typical Aurignacian, Solutrian, and Magdalenian of north-west Europe, being a development of the Mousterian, which is considered, at any rate in part, to be equivalent to Vignard's Sebilian, the type area of the latter being in the Kom Ombo plain about 100 m. above Luxor.

This change of climate from the abundant rainfall of the Older Palaeolithic to the dry conditions of the Sebilian appears to have started in Upper Egypt in the Late Mousterian, the 10–15-foot gravels of which are discontinuous and erratic in their distribution and indicate occasional torrential rain rather than a steady flow. During the Late Sebilian the Nile once more cut into the silts and this degradation was followed by aggradation continuing to the present day. Under the alluvium of this last phase of deposition is concealed the much-sought transition to the Neolithic, here as elsewhere an unbridged gap. We have therefore a glimpse of the history of the Nile in Palaeolithic times, but, with the exception of a skull claimed to be of Sebilian age and of Predynastic Mediterranean type, no clue to the ultimate origin of the people who developed its civilization.

This rough outline of the leading ideas of Dr. Sandford's book hardly does justice to the care with which the evidence is expounded and discussed, or the caution with which conclusions are reached. The temptation to project the levels of degradation and aggradation into the Mediterranean and speculate on their causes and connection with contemporaneous events in Europe is almost irresistible, yet Dr. Sandford refrains. The Palaeolithic history of the Nile is now a standard of reference, as its Neolithic and Bronze Age history have been in the past. Dr. Sandford's book is a great achievement and well worth the years of labour which he has devoted to it. W. B. W.

CENTRAL AND SOUTH AMERICA

LÄNDERKUNDE MITTELAMERIKAS: Westindien, Mexico und Zentralamerika. By OSCAR SCHMIEDER. (Enzyklopädie der Erdkunde. Edited by OSKAR KENDE. Teil [28].) *Leipzig: Franz Deuticke* 1934. 10×7 *inches;* vi+194 *pages; illustrations and maps. Rm.*15

Dr. Schmieder has lived for many years and has travelled extensively in the Americas, and this monograph completes his published studies on both continents. His observations have led him to depart from the established convention and to include Mexico in his treatment of Central America, largely upon the grounds of racial and historical affinities. The title of the well-known series in which the book appears is reflected in the arrangement, for its encyclopaedic character produced rather a disjointed arrangement, and some overlapping and repetition, particularly of the historical material.

His design is to show the historical development and present conditions of the human communities against the geographical background, so that physical geography is given a rather secondary place. His own interests lie in the study of population distribution, so that the individual feature of the book is the detailed description of typical units of settlement, particularly in Mexico. In addition to the sketch-maps and diagrams, there are a number of excellent photographs by the author. The bibliography is quite extensive, but has some gaps in the historical sections. It does not appear to include the works of Labat or Edwards, or Wafer's valuable account of the Indians of the Darien isthmus: nor is there mention of Ower's geological work, Maudslay's 'Glimpse at Guatemala,' or the comprehensive 'Biologia Centrali-Americana.' G. R. C.

SOUTH AMERICAN ADVENTURES. By ALICE CURTIS DESMOND. *New York (and London): The Macmillan Company* 1934. 9×5½ *inches; 284 pages;* 10*s* 6*d*

HIGH SPOTS IN THE ANDES: Peruvian Letters of a Mining Engineer's Wife. By JOSEPHINE HOEPPNER WOODS. *New York [and London]: G. P. Putnam's Sons* 1935. 9×5½ *inches; 320 pages; illustrations.* 12*s* 6*d*

Mrs. Desmond is a North American who after travelling widely and frequently in Europe determined to become well acquainted with the southern portion of her own continent. She and her husband arrived in South America very well provided with introductions and anxious to see everything there was to be seen. They visited both coasts, and Mrs. Desmond makes it clear that they did not confine themselves to the large, cosmopolitan towns, but travelled widely in the interior, making friends with their fellow travellers, observing the local customs and peculiarities of Indian as well as Spaniard. 'South American Adventures' gives a very full and lively picture of the mixture of races and civilizations along the coastal provinces, and the hard-dying Spanish conservatism of the interior, and leaves a delightful impression of a beautiful, highly-coloured continent and a charming and welcoming population, combining the style and taste of Latin civilization with the vigour and practical gifts of the Anglo-Saxon.

Mrs. Woods paints a rather bleaker picture. She is the wife of a North American mining engineer whose mine at Santo Domingo, in Peru, is six days' travel from the coast. 'High Spots in the Andes' is a collection of letters written to various friends, forming a more or less complete chronicle of life in a Peruvian mining village. It does not cover the same range as 'South American Adventures,' but its interest is both more concentrated and more personal, since Mrs. Woods was completely cut off from the outside world and concentrated all her powers of observation on the details of everyday life around her, and the occasional expeditions undertaken by her and her husband. She is never simply the tourist, and her book is written with a background of regular life in South America which makes Mrs. Desmond's more charming and vivid book seem a little superficial. Both however are necessary to an understanding of South America and its problems: and read together they will form an admirable introduction to the subject. M. C.

AUSTRALASIA AND PACIFIC

GOVERNOR ARTHUR'S CONVICT SYSTEM, VAN DIEMAN'S LAND, 1824–36: A Study in Colonization. By WILLIAM DOUGLASS FORSYTH. (Royal Empire Society. Imperial Studies, No. 10. General Editor: A. P. NEWTON.) *London: Longmans, Green & Co.* 1935. 9×5½ *inches;* xvi+214 *pages; portrait.* 7*s* 6*d*

With an annual intake of well over a thousand convicts, it is hardly surprising that Governor Arthur was obliged to be autocratic, and that the government of Van Dieman's Land was vested in a devoted band of officials, supported by stipendiary magistrates. Great organizers are, however, not of necessity "essentially barbaric," and Mr. Forsyth's criticism seems a little harsh, in view of Arthur's later services in Canada and India. If he regarded Van Dieman's Land merely as "a great gaol to the Empire," he was only echoing the views of the Colonial Office; and Bathurst stated, equally categorically, that the growth of Van Dieman's Land as a colony was a secondary consideration.

As governor of a penal settlement, Arthur seems to have been undeniably successful. The basis of the settlement was the assignment of convict labour to

the free settlers, to whom land was granted on condition that they employed convicts. The immigration of free labour or the unconditional purchase of land was discouraged. The dispersion of convicts over the island required the perfection of a system of supervision and the maintenance of strict control, not only over the convicts but over their conditions of labour and hence in a great measure over the free settlers who employed them. During the years of his governorship, which were years of economic prosperity, the system worked. When the balance was upset, after 1840, by increased importation of convicts following the abandonment of transportation to New South Wales, the colonists were able to make their grievances felt, and transportation ceased altogether after 1846. It had already been condemned by a Royal Commission in 1838, as leading (in the words of Lord John Russell) to the creation of "a society, contaminated in its infancy, and fed with new streams of pollution"—though in 1846 Gladstone was advocating renewed settlement in North Australia. As a penal system, transportation had failed, either to deter or reform.

Mr. Forsyth has treated most efficiently both the general problems facing Arthur and the details of his system, supporting his statements with ample statistics. Of particular interest is his last chapter on the Press, and the failure of the Governor, unsupported by the Home Government in this matter, to gag it: the importance attached to relative freedom of the Press both by the pre-Reform Home Government and the colonists, and the part played by the Press in the advance towards representative government, are highly instructive. Mr. Forsyth need not hark back to Stuart times to find precedent for similar efforts to protect a paternal government against criticism. A map would be useful.

J. P. H. M.

ECONOMIC AND HISTORICAL GEOGRAPHY

THE BACKGROUND OF GEOGRAPHY. By M. WHITING SPILHAUS. *London: George G. Harrap & Co.* 1935. 9×5½ *inches;* 286 *pages; illustrations and maps.* 7*s* 6*d*

Mrs. Spilhaus attempts in this book to give both an outline of geographical discovery and a background of general history without which, she rightly maintains, such discovery cannot be properly understood. Her story begins with "the dawn of human knowledge" and ends at the seventeenth century, except for a concluding chapter which "clears up one or two points" such as the final discovery of the north-east and the north-west passages and of the antarctic continent.

In her claim to give an "outline" of discovery Mrs. Spilhaus is unduly modest, for although popular in style her book is full and informative. Some inaccuracies might however be corrected in a future edition. The account of the north-west passage should certainly include the voyages of Foxe and James, who did much to consolidate the work of their predecessors and to guide later explorers in the eighteenth and nineteenth centuries. Franklin's journey of 1825–27 can hardly be called "a voyage from England," and Montreal was not founded in 1604. The treatment of mediaeval maps shows a general lack of appreciation of their character and purpose. They were for the most part diagrammatic representations, and because Matthew Paris shows Canterbury, London, York, and Durham to lie in a straight line this does not mean that he was "vague" about their relative positions: it was enough to know that all lay on the direct route from Dover to the Border.

As for the historical background one suspects that the writer sometimes included what interested her most rather than what is strictly relevant, and was

not always careful to check her generalizations. It is hardly true to describe the Navigation Act of 1651 as "England's first essay in Protection": it was not even her first attempt to protect her shipping. Similarly, to characterize the trade agreement between Venice and the Turks as "self-centred" is to reveal a lack of appreciation of the situation in the Mediterranean at the time. Venice was left alone to fight the Turks; her opposition did much to delay the Turkish advance, and in the course of it she sacrificed her empire. It was hardly surprising that, in her circumstances, she attempted to "agree with her adversary quickly."

The book contains about fifty maps, many illustrations, and a good index. Its usefulness would be increased by some bibliographical references. It is well produced, the price is commendably low, and it can be recommended as a readable and reliable introduction to the history of discovery. J. N. L. B.

PRIMITIVE SOCIETY AND ITS VITAL STATISTICS. By LUDWIK KRZYWICKI. Translated by H. E. Kennedy. *London: Macmillan and Co.* 1934. 10×6½ *inches;* xiv+590 *pages.* 20*s*

Dr. Krzywicki, who is Professor of Social History in the University of Warsaw, wishes to emphasize in this work the importance of vital statistics: "If we are properly to realize the extent, scope and application of primitive customs and institutions, it is indispensable to estimate their weight, *i.e.* to consider them in connection with the number of persons who come under their influence." He began his analysis of the size and composition of the primitive community many years ago and in 1901 published a contribution to the subject in Polish. In the appendices to the present volume the author gives data on the vital statistics of 123 Australian tribes, 503 North American Indian tribes, and 33 North American "confederacies and their equivalents." A fourth appendix deals with the age of Australian women at first child-birth. There is a large bibliography, and the author has made use of a few Russian authorities on Siberia, Alaska, and the Caucasus.

The study of this material has led Dr. Krzywicki to several conclusions, one of which is that "in similar conditions of environment and at relatively equal stages of culture, tribal population varies within narrow bounds" (p. 78). He draws attention to the small number of offspring among hunting peoples, and says that "much time must pass and settled agricultural existence take strong root before childless women begin to be despised and . . . still more before a numerous progeny is looked upon as a divine blessing" (p. 177). Some of the factors at play in the phenomenon of "dying-out races" are well brought out in the third chapter. The book as a whole however produces a somewhat diffuse impression; this is partly due to the large number of generalizations (*e.g.* on the significance of individual personality, p. 293; on the diversity of tribal custom, p. 298) and the rather scattered examples which support them. The main line of the argument is the less easy to follow in that the English translation is far from smooth and adheres too closely to involved foreign constructions. E. J. L.

COMMODORE ANSON'S VOYAGE INTO THE SOUTH SEAS AND around the World. By Vice-Admiral BOYLE SOMERVILLE. *London: William Heinemann* 1934. 9×6 *inches;* xviii+318 *pages; illustrations and maps.* 15*s*

Although there have been several editions of the official narrative of Anson's voyage written by his chaplain Richard Walter, there has hitherto been no history of the undertaking based on all the available sources of evidence. Admiral Somerville has supplied this lack by thorough research of published and documentary material, and has written an authoritative and absorbingly interesting

account. In his Introduction he notices the commission and instructions with which Anson was furnished. The instructions ordered him not only to destroy Spanish shipping but also "to seize, surprise or take any of the towns or places belonging to the Spaniards" on the west coast of South America. Was permanent conquest intended? The author might perhaps have told us more of the variations in the successive instructions that were issued during the long months of delay before the equipment of the squadron was completed: the question of British policy and intentions on South America in the eighteenth century is important but obscure, and any new light would be welcome.

But the purpose of this book is to narrate the heroism of seamen rather than the ambitions of statesmen. The sacrifice of life was terrible, and nearly all of it was due to causes that were even then preventable—rotten victuals, overcrowding, and the shipping of infirm and aged men. The well-known story of the Chelsea pensioners, many of them over sixty, styled marines, is literally true; they died to a man before ever they saw the Spanish colonies they were sent to attack. Such was the paradox of the eighteenth century, so clear in its thinking and humane in its sentiments, so callously stupid and brutal in its management. Modern administrators, with no better resources than those of 1740, would have sent out a very different expedition, and would have had a good chance of achieving the conquests in view. By contrast, the eighteenth century had nothing to learn from the twentieth in endurance and command. It was the naval officers' great period, and this book is outstanding in the picture it gives of Anson himself, surely one of the finest characters the Navy has produced. In every misfortune and at every call to action he did the right thing, and there is not one decision of his that the event did not justify. In re-telling the story of Anson and his crews Admiral Somerville has written a fine piece of history whose value will be permanent. J. A. W.

THE MONTHLY RECORD

A JAPANESE SCIENTIFIC EXPEDITION TO JEHOL IN 1933

In the late summer and early autumn of the year 1933 a Japanese scientific expedition made the first thorough investigation of the Jehol territory in the south-western corner of Manchuria. In the south, Jehol and Hopeh are divided by the Great Wall of China, and in the west Jehol touches Outer Mongolia, while access to the sea is barred to the east by the Liaoning province. The population has been estimated at 2,000,000. The original Mongolian inhabitants were driven out by a wave of Manchurian invasion from the east and by the slow immigration of the Hans, so that at the present day the remains of the Mongol population are concentrated in the north of the country. Disease, bad roads, and the dangers of brigandage had hitherto combined to keep Jehol almost unexplored. The Japanese expedition included experts in Geology, Lithology, Palaeontology, Geography, Botany, Zoology, and Anthropology, as well as a large number of physicians, photographers, interpreters, and bearers, and a body of thirty soldiers for protection against bandits—making in all a body of sixty-two. The expenses of the expedition were paid by the "cultural department" of the Japanese Foreign Office working in conjunction with the South Manchuria Railway; the Foundation for the Promotion of Scientific and Industrial Research; the Asahi Publishing Company, which provided an aeroplane; and the Kwantung Army, which supplied wireless instruments. Owing to the sparsity of the population in Jehol and the primitive nature of such accommodation as existed, it was necessary to lodge the whole expedition in tents. Food, too, had to be taken, since the food of the natives is scanty and prepared under conditions which make the risk of disease great. The expedition was provided with rice, tinned foods, and meat in order to minimize dependance on local supplies.

The climate was another difficulty. Rain falls for one month in the year only, so that almost all the rivers are very low for the greater part of the year. The principal perennial streams which never dry up entirely are the Shara Muren and the Laoha Ho in the north, and Taling Ho in the south-east, and the Lwan Ho in the south. There are no bridges and only a few ferries, so that it is often impossible to cross a river at all during the short rainy season. Temperatures tend to be extreme, the warm weather beginning suddenly in June, when the thermometer almost always registers over 100° F. in the daytime. In September it suddenly becomes intensely cold and winter temperatures are often below 30° F. These peculiar climatic conditions made the tasks of both botanists and zoologists difficult, as flora and fauna can only be observed for the few months in the year following the rainy season. There are hardly any roads worth the name in Jehol, except one running from Chaoyang to Peiping and another from Chaoyang to Chihfeng. Otherwise it was a question of driving lorries and trucks over field country or dry watercourses. Since the Manchurian disturbances of 1931 the whole province has been at the mercy of large armed forces of bandits and the expedition always needed its armed escort with their two machine-guns.

Leaving Hsinking on August 2 the expedition arrived two days later at Pehpiao, where it divided into two parts—the geological and geographical sections under Shigeyasu Tokunaga, and the anthropological and biological under Takenoshin Nakai. On August 17 the whole expedition arrived at Chengteh, the ancient capital of Jehol, where an old Imperial Palace stands in the middle of a kind of natural preserve or sanctuary. For two hundred years this palace has been surrounded by high stone walls making a circuit of 6 or 7 miles, and

even in later Republican days within this enclosure no animal might be killed and no flower or plant gathered or cut, with the result that there are now many rare kinds of birds, plants, and insects to be found there. The spring supplying the lake in this sanctuary has never frozen even in the coldest weather, and it was this fact which made an Emperor of China name the palace (and afterwards the whole province) *Jeho* (hot water). Near the palace there stands a magnificent lamasery, built by the Emperor Kanlung to please the people of the province.

The main body of the expedition stayed for two weeks at Chengteh. A party was sent towards the end of August to explore the Hsing-lun-hsien district and to climb Wuling Shan, the highest mountain in Jehol (2050 m.), while another section went southward and reached the town of Malanyü near the Great Wall, which they crossed towards Kiangtze, returning to Chengteh by Kupehkow. Early in September Tokunaga's party investigated the coal, gold, and other mineral-yielding districts between the northern part of Jehol and Lung-hwa ; and later went to explore the Pleistocene deposits of Chaoyangkow in the north and further coal and gold bearing districts to the east and south-east of Chengteh. The other body of the expedition (zoologist, botanists, and anthropologists) carried their investigations to the northernmost corner of the Jehol province as far as Lake Bor. On October 20 the two bodies of the expedition reassembled at Hsinking and the expedition broke up.

The geological section of the expedition spent much of its time exploring the various coal-bearing seams in the Jehol province, but these proved without exception to be of an inferior quality. Attention was also paid to the loess strata, which were discovered very frequently, especially in the north, where the loess reached a maximum thickness of 50 m. along the Laoha Ho. The botanists of the expedition discovered a number of commercially valuable plants, including the *Ephedra sinica* which is used in the composition of antifebrile medicines. The main work of the expedition seems however to have been done in the department of anthropology. Neolithic remains were found everywhere in Jehol, the country dividing itself into two distinct cultural areas—the one extending along the Lwan Ho and Taling Ho and corresponding to that of North China and Southern Manchuria; the other extending to the north of this line along the Laoha Ho and the Shara Muren, where several finds of unglazed pottery and chipped stone implements were made. During the Bronze Age Jehol seems again to have been subjected to two streams of influence, that of China reaching from the south northward, and the Siberian extending southward from the north. Bronze pots of the *Chin bronze* type are discovered near Pehpiao and remains of the *Scythian bronze* style were plentiful in the northern districts.

A full account of the expedition, from which the above summary is made, was sent to the Society by the University of Waseda and is deposited in the Library, where it may be consulted.

MOUNT WASHINGTON WIND RECORDS

An observatory on the summit of Mount Washington, New Hampshire, was in occupation for seventeen years beginning with 1871. During that period it was discovered that the mountain, which exceeds 6000 feet in altitude, is subject to extremely violent winds, no doubt in consequence of its proximity to the great cyclone track across the Great Lakes. Wind velocities over 100 miles an hour were of frequent occurrence especially during the winter, and these hurricanes were generally accompanied by rime-depositing fog, which indeed prevailed for more than half the time in winter. In the working of the anemometer much the same difficulties were experienced from wind, rime, and snow-drift as on

Ben Nevis. The cups of the Robinson anemometer could not stand the terrific impact of the wind, and the machinery on many days became so badly clogged with rime that no readings at all were obtained. These difficulties were not satisfactorily surmounted until in 1932 the observatory was re-opened and a new design of anemometer was employed. In this the cups of the Robinson pattern are replaced by a wheel-cup rotor, and the instrument is fitted with an electrical heating apparatus to thaw rime, hoar-frost, and snow. This instrument, installed 10 feet above the roof of the observatory, is found to work accurately at the high wind-speeds for which it was designed, but low wind-speeds, which are rare on Mount Washington in winter, are recorded by a heavily braced cup anemometer at 30 feet above the roof. On one occasion the anemometer functioned perfectly in thick fog at the very low temperature of −46° F. in a wind blowing at the rate of 120 miles an hour.

The new anemometer, a highly technical account of which is given by D. W. Mann and C. F. Marvin in the *Monthly Weather Review* for June 1934, was set up in time to record a storm of extreme violence on 11 and 12 April 1934, the circumstances of which are described in the same paper by S. Pagliuca. The storm began on the morning of the 11th with a south-east wind blowing at 80 miles an hour at a temperature of 22° F. By the afternoon the summit became enveloped in clouds so that rime was soon copiously formed. During the night the hourly wind movement was never less than 107 miles, and next morning it rose to 155 miles with gusts reaching a velocity well over 200 miles an hour. In the early afternoon, soon after the barometer had reached its lowest point, 22·82 inches, an extreme gust of 231 miles an hour was registered, which is the highest natural wind velocity ever recorded by anemometer anywhere on the Earth's surface. With the abatement of the wind during the afternoon of the 12th the snowfall increased in intensity and by evening had amounted to 10 inches, whilst the accumulation of rime on exposed objects reached a maximum thickness of 3 feet. The observatory building shook considerably under the severe impact of the wind, but the heavy covering of rime must have increased the rigidity of the structure. The deposit on the lower part of the anemometer post is considered to have slightly reduced the velocity of the wind so that the figures quoted should be regarded as somewhat conservative. No serious difficulty was experienced by the observers who adopted various postures in attending to their outdoor duties in the extreme conditions; but it is pointed out that the wind-pressure is less by one-fifth part at 6000 feet than at sea-level, and that the velocity actually experienced near a rough rocky surface is considerably less than in the free air where the anemometer is exposed.

EUROPEAN MOUNTAIN FLOODS

The high mountain ranges of Europe are subject to sudden, widespread downpours of rain called by the French "averses," in which from 10 to 20 inches of rain may be measured in twenty-four hours. In an article by M. Pardé entitled "Crues pyrénéennes et crues carpathiques," which appears in the *Revue Géographique des Pyrénées et du Sud-Ouest* (tome V, fasc. 4, 1934), a comparison between such deluges in the Pyrenees and Carpathians is preceded by a discussion of like conditions in the various sections of the Alps. The article, in fact, amounts to a discussion of the hydrological regimen of the French Alps to the extent that they discharge to the Rhône, the Swiss Alps to the Rhine, the Italian Alps to the Po, the Austrian Alps to the Danube, the Pyrenees to the Garonne, and the Carpathians to the Vistula.

The French Alps appear to suffer least from general floods. In the north the bad storms occur with Atlantic winds in winter when snow at the higher levels

holds up much water that would otherwise swell the Rhône tributaries, whilst in the south the storms are brought by Mediterranean winds. Moreover the tributaries which enter the Rhône more or less at right angles are at considerable distances from one another and so fail to cause a maximum concentration of water in the main stream. In Switzerland severe summer storms would cause bad floods in the valleys of the Upper Rhine, Reuss, and Aar if so much water were not intercepted by the lakes. On the Italian side of the Alps where terrible storms are common, especially in late spring and in autumn, the lakes also save the situation in the basin of the Po; but when the rains are contemporaneous over the Alps and Appennines serious floods occur in parts. In the Austrian Alps the summer storms are described as extremely violent, but the disposition of the streams which enter the Danube is not conducive to the worst effects.

In the Pyrenees conditions are much more pernicious than in the Alps. On the northern side the Garonne, Ariège and other streams collect water from the greater part of the mountain wall of the Pyrenees properly so called, in such a manner that all the elementary flood-waters during widespread storms converge upon the main stream above Toulouse. The consequence is that disastrous floods occur in the Garonne valley from time to time, the worst being that of June 1875 when several hundred people lost their lives.

The Vistula is not so much affected by the summer storms as the Garonne, because the arrangement of the tributary streams permits of no such coincidence of their separate flood-crests. The Carpathian storm which did so much damage in July 1934 was even more severe than the Pyreneean storm of June 1875, particularly in the valleys of the Raba and Dunajec.

An interesting parallel is drawn between the summer storms of the Pyrenees and Carpathians. Both ranges trend east and west and get their worst storms with north-west winds—the Pyrenees chiefly in May and June, the Carpathians in July and August. These winds, charged with the moisture of the Bay of Biscay or the North Sea, bring masses of air which become very unstable in passing over the heated plains and give rise to violent downpours of rain on meeting the obstructing mountain ranges.

REGULATIONS OF THE O. U. EXPLORATION CLUB

We have recently received from the Oxford University Exploration Club a copy of their Regulations for the Organization of Expeditions, and the fact that these rules are the result of over ten years' accumulated experience seems to indicate that they must work well in practice and that they may therefore be useful to others interested in promoting similar expeditions. The Regulations deal firstly with the initiation and planning of an expedition and then with the control of the expedition after it has been successfully launched.

The Organiser of the new expedition must in the first instance lay his plans before the Club's Expedition Council; the latter is a body of five nominated by the President, one being an undergraduate, and the Senior Treasurer acting as Secretary. If the Council have endorsed the plans they then approve the appointment of a Home Agent, suggested by the Organiser, and themselves cease to take any further active part. The Council in effect confines itself to considering the Organiser's personal abilities, the desirability or otherwise of having a Senior Leader, the safety of the expedition, and the general scope of the plans having regard to the Club's reputation. The planning stage concludes therefore with the Council leaving all further details to the Senior Treasurer, the Organiser, a Home Agent, and a possible Senior Leader. All advisory work thereafter is left to the Home Agent, who must be a senior member of the Club, while finance remains under the supervision of the Senior Treasurer. The

Home Agent and the Senior Treasurer are responsible for the affairs of the expedition in this country, while it is abroad. Though not expressly stated it may be inferred that the Organiser himself becomes Leader if no Senior Leader has been suggested.

The remainder of the pamphlet sets out the Expedition Rules, which the Leader and all members must sign. The Leader is given the last word in regard to choice of personnel, but he is expected to choose from members of the Club as far as possible, and in general at least half his party from among resident undergraduate members. He is also given full control of all press and publicity matters, but must exercise these rights with regard to the fact that the Club is responsible to the Vice-Chancellor. In regard to funds it is a principle that each member must contribute a sum equal to what he would have spent if he had not gone on the expedition. It is also laid down that no expedition member may publish a book on the expedition without authority from the President, who shall determine the allocation of profits, and that no business firm is permitted to use the name of the Club or of the expedition on advertisements in return for goods given free or at reduced rates. Both these points it may be assumed have been sources of trouble in the past, and the fact that the rules are now put in such definite form will both prevent unnecessary and undesirable publicity, and also relieve the Leader from what might be an invidious and awkward position. A selection only of the rules has been given, but enough probably to show that they answer their dual purpose of preventing misunderstanding and friction and of giving the greatest possible flexibility and efficiency.

REINDEER FOR NORTHERN CANADA

In the *Journal*, vol. 75, p. 476, reference was made to a scheme adopted by the Canadian Government for driving a large herd of reindeer from Alaska to the Northwest Territories, where the conditions of the Eskimo population was giving rise to anxiety. This scheme has now been carried out, and the herd which left the Buckland valley on the west coast of Alaska in December 1929 and arrived at the grazing area to the east of the delta of the Mackenzie River, is reported to be thriving. The overland trek of the herd, which the reindeer expert, Mr. Robert T. Porsild, and his Lapp herders calculated to be a two-years' journey, took nearly twice that time owing to the unparalleled storms of the 1932–33 winter and the hitherto unknown homing-instinct of the reindeer—a factor which will now favour the settlement of the reindeer in their new district. In May of this year it was reported that the fawning season was well advanced, that six hundred healthy fawns had already been born and that more were expected: this is said to speak well for the condition of the herd.

The reindeer station consists of an area of 6600 square miles covered with reindeer moss, extending inland from the coast along the east bank of the Mackenzie River. Summer and winter ranges are included in this area, which is also equipped with corrals, a superintendent's residence, cabins for the herders, and other necessary buildings.

DROUGHT IN THE PRAIRIE PROVINCES OF CANADA

In the last few years the drought problem in the provinces of Manitoba, Saskatchewan, and Alberta has come to the notice of the Government authorities and steps have been taken to try and remedy the evil as far as possible. The southerly belts of these three provinces have naturally developed more swiftly than the northerly, although the recent spread of mining activities in the north has contributed to the spread of the population in that direction, and the use of aircraft has made it possible to work in districts which were formerly inaccessible.

The development of the southerly belts has been gradually facilitated during the past seventy years by the construction of a network of railways. But a large area in Southern Alberta and Saskatchewan, which goes by the name of *Palliser's Triangle*, has suffered so badly from drought during the past four or five years that many farms have had to be abandoned and many cattle destroyed. This district has always been an area of marginal land: that is to say, the soil and climatic conditions have rarely allowed a large margin of safety to the farmer. The period required for maturing grain and the period actually suitable for farming have nearly coincided, and the actual precipitation, modified by rapid evaporation, has often barely supplied the amount of moisture necessary to the crops. It has been estimated that about four-fifths of the winter precipitation in Western Canada is lost to agriculture in the spring run-off. In addition to this, many of the early farmers indulged in what has been called "wheat-mining": they sowed and reaped, that is to say, with no consideration for the future productiveness of the land, and when the soil became impoverished, they took no steps to replenish it with natural or artificial manures. Over-grazing was also prevalent in some districts, with the result that after several successive years of drought the soil over large areas became almost valueless. In some places it was excessively alkaline; in others the high winds which sweep across the prairies carried away the surface soil altogether, so that the problem of cultivating the marginal areas, made more difficult by long periods of drought, rapidly became acute owing to unscientific methods of farming, the absence of tree-belts to serve as wind-breaks, and the lack of any extensive system of moisture-conservation. Added to this was the considerable damage caused by grasshoppers.

"The Prairie Farm Rehabilitation Acts," which received the Royal Assent on 17 April 1935, has set up a Committee to consider the best methods of coping with these problems by means of farm practice, tree culture, and water-supply; and the Government has set aside a sum of 750,000 dollars to be spent during the year 1935–36. Meanwhile drastic measures are being taken to reclaim those parts of the country which have already been abandoned as hopeless, and every effort is being made to increase as quickly as possible the development of the best grass-seeds, grain, and clover, and to make them available in the selected areas.

THE PRESIDENT OF JOHNS HOPKINS

Exactly twenty years after his appointment as Director of the American Geographical Society, Dr. Isaiah Bowman resigned his post on June 30 to enter upon the eminent office of President of Johns Hopkins University. Dr. Bowman's services to geography have been long and distinguished, and he will doubtless continue to influence the activities and research work of the Society. During his tenure as Director he developed its activities in many directions, notably in transforming the Bulletin into the *Geographical Review*, at first issued monthly but now a quarterly, and in the compilation and publication of the 1/Million Map of Hispanic America. This work, which followed closely the scheme of the International 1/M map, was begun in 1920: two years later the first (La Paz) sheet appeared, accompanied by a monograph by Prof. A. G. Ogilvie, which owed much to Dr. Bowman's own journeys in the Andes between 1907 and 1913. By 1934, fifty sheets of the map had been published. Several other series of special publications were also inaugurated through his initiative, of which the monographs upon Pioneer Settlement are especially important. His activities have recently found a wider field as Chairman of the National Research Council, Director of the Science Advisory Board, and President of

the International Geographical Union. President Bowman will carry with him to Baltimore the good wishes of his geographical friends in many countries, and leaves behind him in New York an organization deeply impressed with the stamp of his personality.

MEETINGS: SESSION 1934–35

Fourteenth Evening Meeting, 27 May 1935. The President in the Chair

Elections: Oliver Brockbank, M.A.; Leonard Fradgley; Lawrence Gibbs; Robert Brian Horner; Dinkar Hari Limaye, M.A., B.COM.; Horace William Devereux Longden; Peter Bromley Maling, M.SC.; Captain George Burt Nasmyth; Richard M. Philips; Miss Ethel Pickering; George Offley Whitehead.

Paper: A Journey in Bhutan. By Major C. J. Morris

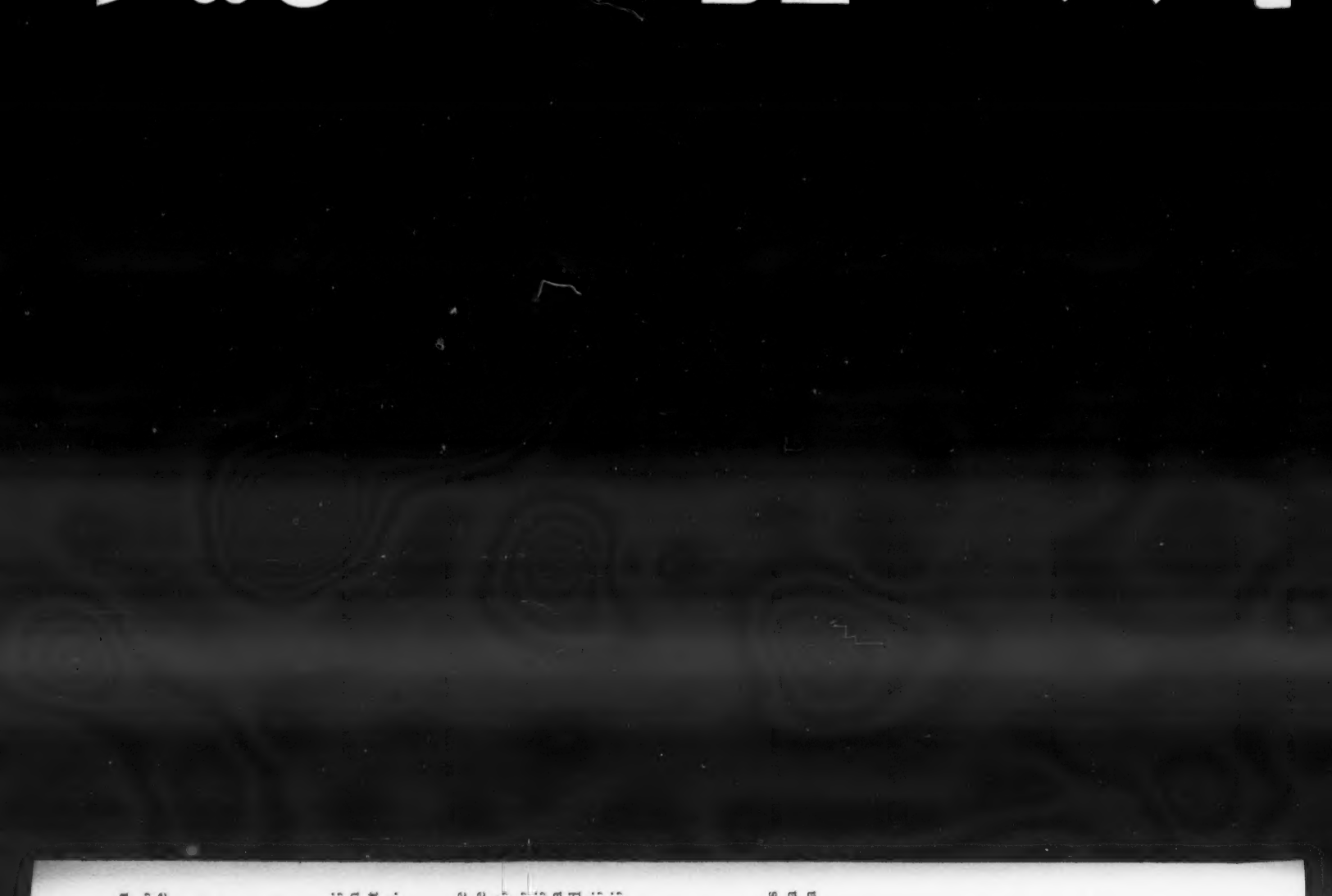
Fifteenth Evening Meeting, 17 June 1935. The President in the Chair

Elections: Captain William Llewellyn-Amos; Barnham Brown; Miss Estelle Canziani; J. W. Cardwell, B.A.; Mrs. Alice Hilda Cocksedge; Henry Savile Collins; The Hon. Mrs. Dalgety; Harold Frank Escott; Bolivar Lang Falconer, SC.M., A.M., M.D.; Clarence Hubert Murrell Foster, M.A.; William B. Greenlee, B.SC.; Mrs. Beatrice Buckland Grey, F.L.S.; Aubrey George Goodrich Hanks; The Rev. Canon James Owen Hannay; John K. Howard; Shri Paul Chandera Jaina; Louis Kraft; William Henry Mooring; Susilan Palpu; Osborne David Philips; Captain Robert Johnston Powrie; The Rev. Glanmor Myrddin Rees; Basil James Rogers; Miss Katharine Muriel Sheppard; Stephen Simpson; Keith Langford-Smith; Ernest George Trent; Mrs. Edgar Worthington

Paper: An Expedition to the Canadian Arctic. By Mr. J. M. Wordie

Seventh Afternoon Meeting, 20 May 1935. The President in the Chair

Paper: The Hagavtn Gorge, Iceland. By Mr. John Wright

Jan Mayen: correction

We regret that one of the photographs which illustrated Mr. E. G. Bird's paper (June *Journal*, facing p. 554) was by an error described as "The skull of a Greenland whale (Balaena mysticetus)." The title should read "The skull of a Balaenoptera, probably Blue Whale (B. musculus)."